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INTRASYSTEM ELECTROMAGNETIC COMPATI-
BILITY ANALYSIS PROGRAM. VOLUME II.
USER'S MANUAL USAGE SECTION

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McDonnell Aircraft Company

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20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

This user's manual describes the operation and usage of the Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). IEMCAP is a USA Standard FORTRAN program for computer-aided implementation of electromagnetic compatibility (EMC) at all stages of an Air Force system's life cycle, applicable to aircraft, space/missile, and ground-based systems. Extensive knowledge of computers is not required to use the program and all inputs are in

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20. ABSTRACT (continued)

easy-to-use, free-field format.

This volume, the Usage Section, contains detailed instructions for usage of IEMCAP. A complete description of the input data requirements, formats, and rules for applying them are given. Instructions are also given for data setup and program execution for the various analysis tasks. Sample outputs are presented and described to aid in interpretation of analysis results. An example run is also presented in which a typical system is analyzed. This shows how engineering data is converted into the IEMCAP input format and gives samples from the resulting computer output.

Three appendices are provided. The first describes test methods for use with the computer-generated EMC specification limits along with an example. The second appendix describes a separate merge utility program. This program performs supplemental data file management which consolidates two files. The third appendix describes the usage of another separate program which provides supplemental intermodulation frequency analysis.

PREFACE

This documents work conducted by McDonnell Aircraft Company, St. Louis, Missouri, on the Intrasystem Electromagnetic Compatibility (EMC) Analysis Program, sponsored by Rome Air Development Center, Griffiss Air Force Base, New York, under Contract F30602-72-C-0277, Job Order 45400127, from 19 May 1972 to 19 November 1973. Mr. James C. Brodock (RBCT) was the RADC Project Engineer.

This volume, the Usage Section of the User's Manual, contains instructions for preparing the input data, running the program, and interpreting the resulting output. Volume I, the Engineering Section of the User's Manual, contains descriptions of the program, its organization, analytic basis, operating principles, and logic flow. Volume III contains detailed descriptions of all subroutines, variables and constants used in the program. Volume IV contains complete FORTRAN source listings and detailed flow charts.

Contributions to this contract effort from Mrs. C.E. Clark, Mr. R.E. Plummer, Dr. C.D. Skouby, and Mr. G.L. Weinstock are gratefully acknowledged.

Information on these documents and on how to obtain a magnetic tape listing of the program may be obtained from Mr. Brodock, RADC/RBCT, Griffiss AFB, NY 13441.
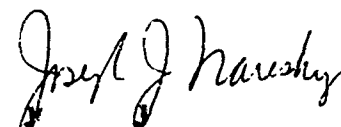
This report has been reviewed by the RADC Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nations.

This technical report has been reviewed and approved for publication.

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Section 1

PRIMARY REQUIREMENTS

This volume contains detailed information for the usage of IEMCAP.
Procedures and formats are given for preparing the input data, executing
the program, and interpreting the resulting output. Computer requirements
and resources as well as program setup are also discussed. An example test
case is included to further illustrate the program use.

1.1 PROGRAM OPERATION REVIEW

The first step in using IEMCAP is to assemble the appropriate data
for the system to be analyzed. This data is then prepared for punched
cards, which are then fed into the Input Decode and Initial Processing
Routine (IDIPR) section of IEMCAP.

IDIPR consists of two major parts. The first (Input Decode or IPDCOD)
decodes the punched cards and checks for errors. If an error is detected
an appropriate diagnostic message is printed, the card is deleted (i.e.,
assumed not to have existed), and the program continues processing the rest
of the data. The program normally stops after all data has been read if
there were errors, but this may be overriden if desired.

If there were no input card errors, the Initial Processing Routine (IPR)
section of IDIPR is entered. If this is the first run for the system, the
spectrum math models are accessed for each port. These use the user-supplied
spectrum parameters to generate the required and initial non-required spectra.
The processed user and spectrum data is written on a permanent magnetic tape
or disk file called the Intrasystem File or Intrasystem Signature File (ISF).
This ISF can be used as input for subsequent runs, either as is or modified
by additional card inputs; and a new ISF can be generated containing the
modifications. Thus, an updated ISF can be maintained if the system design
is changed. The data is also written on a number of working files for use
by the Task Analysis Routine (TART) section of IEMCAP, and a printed report
of the data is also generated.

The TART section of IEMCAP performs the four basic analysis tasks.
These tasks, which are discussed in detail in Volume I, are summarized
below:

o   Specification Generation – Adjusts the initial non-required emission
    and susceptibility spectra such that the system is compatible.
    The user-specified adjustment limit prevents too stringent adjust-
    ments. A summary of interference situations not controllable by
    EMC specifications is printed. The adjusted spectra are the maximum
    emission and minimum susceptibility specifications for use in EMC
    tests. (See Appendix A for test procedures.) Analysis results are
    written on the Baseline Transfer File (BTF) for subsequent runs.

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o **Baseline System EMC Survey** - Surveys the system for interference. If maximum of the EMI margin over the frequency range for a coupled emitter-receptor port pair exceeds the user-specified printout limit, a summary of the interference is printed. Total received signal into each receptor from all emitters is also printed. The analysis results are written on the BTF for subsequent runs.

o **Trade-off Analysis** - Compares the interference for a modified system to that stored on the BTF from a previous specification generation or survey run. Thus, the effect on interference of antenna changes, filter changes, spectrum parameter changes, wire changes, etc. can be assessed.

o **Specification Waiver Analysis** - Shifts portions of specific port spectra as specified and compares the resulting interference to that stored on the BTF. Thus, the effect of granting waivers for specific ports can be assessed.

TART is composed of two basic routines. The Specification Generation Routine (SGR) performs the first task above, and the Comparative EMI Analysis Routine (CEAR) performs the remaining three. These interface with the coupling math model routines to compute the transfer ratios between emitter and receptor ports.

1.2 COMPUTER REQUIREMENTS

The two parts of IEMCAP are executed separately with data files used for intermediate storage between parts. Computer resources used are illustrated in Figure 1.

Central Processing Unit (CPU) core memory to load and execute each part of IEMCAP on a CDC 6600 using the Fortran Version 2.3 compiler are as follows:

    IDIPR - 64K words (decimal)
    TART - 67K words (decimal).

These include input/output buffer storage of 1K per file.

The computer must have sufficient file storage for 4 permanent and 10 working files, in addition to normal card input and printed output. The permanent files can be either disk or tape. For the working files, disk should be used because of the number of files and large number of accesses per run. All files are sequential so that random access software is not required.
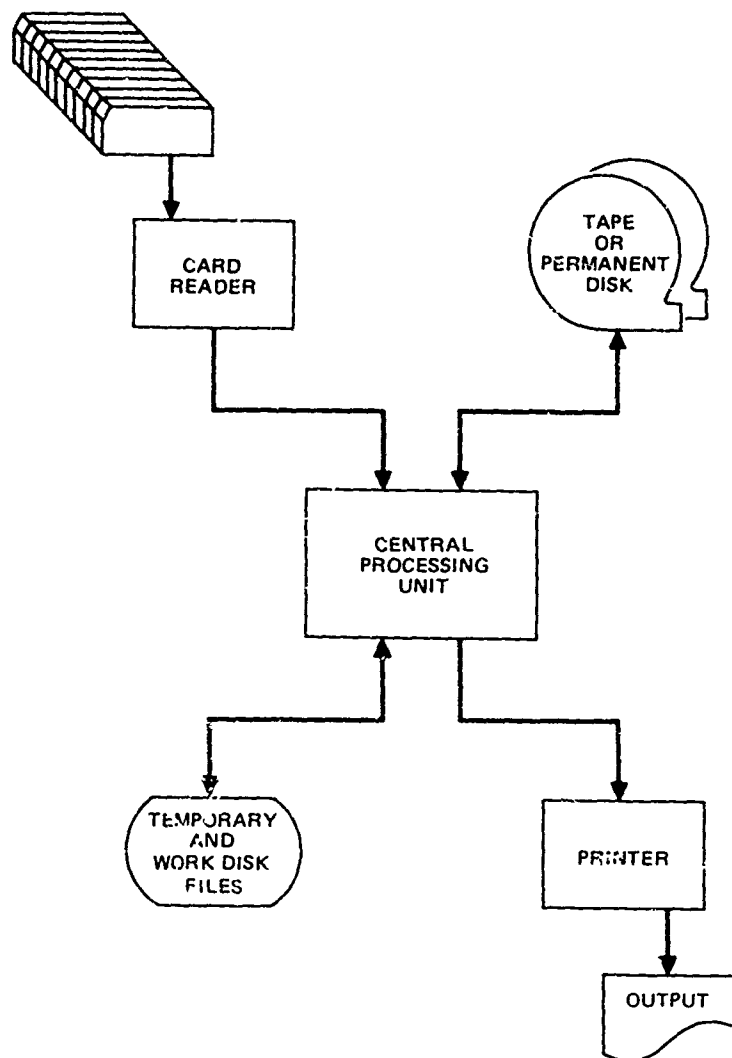
FIGURE 1

IEMCAP COMPUTER RESOURCES

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The amount of file space needed depends on the size of the system being analyzed. Except for the BTF, the size depends primarily on the number of ports. The size of the BTF depends on the number of coupled port pairs since it stores the analysis results.

The execution time also depends on the system size. IDIPR time is approximately 0.1 second per input card. TART run time primarily depends on the number of coupled port pairs. This potentially increases as the square of the number of ports. In general though, each emitter port will not be coupled to each receptor port so the actual time will be less. Also, the TART time depends on the analysis task. Specification generation requires three pass.es through the emitters per receptor with two passes through the receptors per run and hence runs longer than the other tasks. Table 1 gives the run times and file sizes for two test cases run on the CDC 6600. Case 1 is the "mini system" test case presented in Section 5.

1.3 DATA STORAGE FILES

As discussed above, IEMCAP uses a number of data files. In Table 2 these files and the input and output are summarized. Each physical file and device is assigned a logical unit number which is stored in each section of the program as a mnemonic variable name. For example, in the CDC 6600 the card input is designated as logical unit number 5. In IDIPR and TART, the variable INN is set to 5, and all card input read statements reference INN. If in a particular computer, the card reader is a different unit number, all card inputs can be changed to this unit number by changing INN. The logical unit numbers are usually assigned to files in the computer job control cards. (See Section 3.2.) Also, note that a number of files are assigned to the same logical unit. This allows multiple usage of the same physical file space.

The files are categorized as permanent. working and scratch. Permanent files are used to store data and analysis results for use in subsequent runs. Working or intermediate files provide temporary storage for the data in a form for efficient use by the various routines. They also provide intermediate data storage between IDIPR and TART. Scratch files are used for temporary storage within IDIPR and TART.

1.3.1 Permanent Files

These files are generally saved after a run or are input from a previous run. They are the old and new (updated) Intrasystem Signature Files (also called the Intrasystem File or ISF) and the Baseline Transfer file. A description of these follows:

Old Intrasystem Signature File (Old ISF). This is an input file created during a previous run either by IDIPR or TART. It contains data defining the system being analyzed including user-defined input parameters, processed data, and port spectra. It may or not be present for a given run. If not present, the system is defined by card input only. If present, the

TABLE 1

EXECUTION TIMES AND SIZE OF PERMANENT AND WORK FILES FOR SAMPLE RUNS

	TEST CASE 1	TEST CASE 2
DATA CASE SIZE		
Total No. Cards Input to IDIPR	170	241
Total No. Ports	33	56
EXECUTION TIMES		
Execution time IDIPR	17.4 sec	24.5 sec
Execution time TART-SGR	176 sec	186 sec
FILE SIZE IN WORDS (Decimal)		
New ISF	10,862	16,000
Baseline Transfer File	35,000	41,000
Emitter Spectrum	3012	4200
Receptor Spectrum	1792	2670
Emitter Equipment	1634	2350
Receptor Equipment	1631	2380
Wire Bundle	97	400
Wire Map	640	2390
Array	183	300
PIF	3000	4200

NOTE: All figures are based on executions on a CDC 6600

TABLE 2

FILES USED BY IEMCAP

FILE NAME	TYPE	USE*	IDIPR Mnemonic	TART Mnemonic	LOGICAL UNIT	USUAL DEVICE	IDIPR TASK Requiring File (1=input,0=output)	TART TASK Requiring File (1=input,0=output)
1. SYSTEM INPUT	BCD		INN	INN	5	CARDS	All (I)	All (I)
2. CARDIN	BCD	S	IT3	--	3	DISK	All (O/I)	--
3. Processed Input File (PIF)	BCD	S,P	IT1	--	1	DISK	All (O/I)	--
4. Old Intrasystem Signature File	BCD	P	IT4	--	4	TAPE/DISK	All if JOBSTATUS = OLD or MOD (I)	--
5. New ISF (Generated by IDIPR)	BCD	P	IT6	JT4	16	TAPE/DISK	SGR,CEAR,optional tor ISP (O)	All (I)
6. New ISF (Generated by TART)	BCD	P	--	IT6	22	TAPE/DISK	--	SGR (O)
7. Unadjusted Emitter Spectrum File	Binary	W	IT10	IUESF	10	DISK	SGR,CEAR (O)	SGR (I/C) All others (I)
8. Unadjusted Receptor Spectrum	Binary	W	IT11	IURSF	11	DISK	SGR,CEAR (O)	SGR (I/O) All others (I)
9. Emitter Equipment File	Binary	W	IT12	IEEDF	12	DISK	SGR,CEAR (O)	All (I)
10. Receptor Equipment File	Binary	W	IT13	IREDF	13	DISK	SGR,CEAR (O)	All (I)
11. Wire Bundle File	Binary	W	IT14	IWBF	14	DISK	SGR,CEAR (O)	All (I)
12. Wire Map File	Binary	W	IT25	IWMF	3	DISK	SGR,CEAR (O)	All (I)
13. Array	Binary	W	ITXX	ITXX	21	DISK	SGR,CEAR (O)	All (I)
14. Adjusted Emitter Spectrum File	Binary	S	--	IAESF	17 or 10	DISK		SGR
15. Adjusted Receptor Spectrum File	Binary	S	--	IARSF	18	DISK	--	SGR,SU (O) TO, WA (I)
16. Baseline Transfer File	Binary	P	--	ITRNF	19	DISK	--	SGR (I/O)
17. SGR Scratch File	Binary	S	--	ISCRF	10 or 17	DISK	--	SGR (I/O)
18. Scratch Transfer File	Binary	S	--	ISCHTR	22	DISK	--	SGR (1/O)
19. System Output	BCD		IOU	IOU	6	PRINTER	All (O)	All (O)

*NOTE: S = Scratch File; P = Permanent File; W = Working File

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old ISF data may be analyzed as is or modified by additional card inputs.
A user can have as many different ISF's as desired, although only one is
used as input per run.

New Intrasystem Signature File (Generated by IDIPR). This is an output
file created by IDIPR from the card input data or from an old ISF modified
by card input. The format is identical to the old ISF described above.
It is used as input for TART.

New Intrasystem Signature File (Generated by TART). This is an output
file created by TART during specification generation runs. It is identi-
cal to the above new ISF except that it contains the adjusted port spectra.

Baseline Transfer File. This file is built by TART during SGR or
survey runs and contains the received signals, transfer ratios, and EMI
margins for all coupled port pairs and from the total signal and environ-
mental field into each receptor at all frequencies. This is an input to
TART for waiver analysis and trade-off analysis runs.

1.3.2 Working Files

These files may or may not be saved for a given run. This would depend
on whether IDIPR and TART are run independently or are run consecutively as
one job. If run separately, for example to check the input data for errors
only, the working files must be saved for TART. The working files can also
be saved for restart in the event of errors. (See Section 3.3.) These
files are as follows:

Unadjusted Emitter Spectrum File (UESF). This file, as built during
initial processing, contains the initial broadband and narrowband spectra
for all emitter ports. During specification generation runs, SGR adjusts
these spectra and writes them on the Adjusted Emitter Spectrum File (AESF).
After all emitters have been examined and adjusted in conjunction with a
given receptor, the AESF and UESF are swapped, and the process is repeated
for the next receptor. For analysis tasks other than SGR, the UESF is used
only as input by TART since no spectrum adjustments are made.

Unadjusted Receptor Spectrum File (URSF). This file is the same as
the UESF above except it contains receptor port spectra.

Emitter Equipment Data File (EEDF). This file is built during initial
processing containing all equipment and port parameters, except the spectra
and spectrum pointers, for emitter ports. Because TART selects a receptor
and analyzes all emitter ports against it, equipment data is written on
separate files for emitters and receptors for efficient processing. If a
given port is both an emitter and receptor, the data is on both files.

Receptor Equipment Data File (REDF). This is the same as the EEDF
above except it contains receptor data.

. Wire Bundle File (WBF). This file, built during initial processing, contains all wire bundle data for the system. This data is in the form specified in the IDIPR input data.

Wire Map File (WMF). This file, built during initial processing, contains processed wire bundle data in the form of cross-reference map arrays relating the wires, segments, and ports. This data is used as input to the wire-to-wire and field-to-wire transfer model routines in TART.

Array. This file, built during initial processing, contains basic system data, control flags, data change codes, and other data for use by TART.

1.3.3 Scratch Files

These files are used completely within IDIPR or TART for temporary data storage. They are generally not saved after a run, but some share the same physical file as a permanent or work file which is saved. The PIF may be saved for restart. These files are as follows:

CARDIN. This file is used by IDIPR to store the card images of the input cards during input decode. It is later overwritten and used as the Wire Map File.

Processed Input File (PIF). This file is built by IDIPR during input decode. For new jobs (no old ISF exists), the format of the PIF is the same as the ISF except there are no emitter and receptor spectra. For modify jobs, the system data is not written on the PIF, but the equipment and wire bundle data is written in the same format as on the ISF. The PIF may be saved for restart as discussed in Sections 3.1 and 3.3.

Adjusted Emitter Spectrum File (AESF). This file is used by TART during specification generation and contains the adjusted spectra for the emitter ports. The logical unit switches back and forth between AESF and UESF files each time the emitter spectra are re-adjusted as discussed above for the UESF.

Adjusted Receptor Spectrum File (ARSF). This file is the same as the AESF except that it contains the adjusted receptor spectra.

SGR Scratch File (SCRF). This is used during specification generation to store adjusted emitter spectra and transfer functions used in the determination of unresolved interference. The logical unit used is the one which was not used to store the final adjusted emitter spectra.

Scratch Transfer File (SCHTR). This file is used by TART during specification generation and contains the transfer ratio from each coupled emitter into the receptor at each frequency.

Section 2

INPUT DATA REQUIREMENTS

2.1 DATA ORGANIZATION

The input data directs the program and defines the system to be ana-
lyzed. All directives and data discussed below are inputted to IDIPR. TART
has only one mandatory input card and one optional card on which basic para-
meters specified to IDIPR may be overridden.

The program directives specify the analysis task and the form of input
and output for the run. They also supply a title and remarks which are in-
cluded in the printed output to identify the run.

The rest of the data defines the system to be analyzed and is organized
into three basic categories: 1.) system data, 2.) subsystem data, and
3.) wire bundle data. Each of these categories is organized into a hierarchy.

The system data defines the system type (aircraft, spacecraft, ground)
overall physical dimensions, coordinate system parameters, and basic analysis
parameters applying to the entire system. It also includes common model
parameter tables. These tables contain basic parameters for apertures, an-
tennas, filters, and wire characteristics which have multiple use throughout
the system. They are referenced at the port level so that the basic para-
meters are specified only once. For example, assume a particular antenna
type is used for 20 ports in the system. The antenna physical dimensions,
main beam shape, gain, etc. are specified in the system data along with an
identifying name. In the port data, this name is referenced, and only the
antenna coordinates and main beam orientation are specified for each of
the 20 ports using the antenna.

The subsystem data is organized into the heirarchy discussed in Volume I.
The heirarchy is summarized here for reference:

> Subsystem. A subsystem consists of well defined parts of a system
> usually performing a related task. A radar package and a central com-
> puter complex are examples of subsystems. This level is defined for
> convenience in organizing the data and is not a functional level within
> the program. Hence, equipments need not be specified with reference to
> a subsystem.

> Equipment. An equipment is a physical box mounted in the system, such
> as a transmitter unit.

> Port. A port is a point of entry or exit of electromagnetic energy from
> an equipment. A port may be connected to an antenna or to a wire.
> Leakage into and out of the equipment case is also a port. A port may
> be designated as a source (emitter), a receptor, or both. The analyses
> are performed on a port-to-port basis. All ports within the same equip-
> ment are assumed compatible with each other.

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Source. A source is a port which emits electromagnetic energy. The terms source and emitter are used interchangeably throughout the program.

Receptor. A receptor is a port which is susceptible to electromagnetic energy.

Wire bundle data is also organized into a heirarchy, which allows complex wire routings to be analyzed. The components are as follows:

Bundle. A bundle is a group of wires which, for some portion of their lengths, run parallel to each other.

Bundle point. A point in the system at which a bundle branches or changes direction. Between points wires are assumed to run in straight lines, and no branching occurs.

Segment. A segment is a section of a bundle running between points. Segments are designated by giving the bundle points. Within a segment the wires are assumed to run parallel. A segment may also run by a dielectric aperture and be exposed to energy from external antennas and environmental electromagnetic fields.

Wire. A wire connects two or more ports. Its routing is specified by designating the bundle points through which it passes for which segments have been defined. Care must be taken that a wire routing not close on itself or an error will result. The wire physical parameters are given by referencing the Wire Characteristics Table, which is specified at the system level.

2.2 MAXIMUM SYSTEM SIZE

The capacity of IEMCAP with regard to system size is given in Table 3.

TABLE 3

MAXIMUM SYSTEM SIZE	
EQUIPMENTS	40
PORTS PER EQUIPMENT	15
TOTAL PORTS (40 X 15)	600
APERTURES	10
ANTENNA TYPES	50
FILTER TYPES	20
WIRE BUNDLES	10
SEGMENTS PER BUNDLE	10
WIRE PER BUNDLE	50

2.3 INPUT DATA CARD FORMATS

2.3.1 Basic Format

The user input format provides an easy-to-use and flexible means of specifying the diverse types of data required by IEMCAP. Examples of IEMCAP input cards are listed in Figure 2. The format is easy to learn, and parameters are in units in which the engineering data is commonly available on aerospace systems. These are converted by the program to the units required by the models.

Except for TITLE and REMARK cards, inputs are free field. That is, parameters can be punched into any columns of the cards. Blanks are ignored so the entries may be indented and the parameters grouped as desired for clarity. A card may be continued on the next provided the last nonblank character on the card to be continued is a comma.

The inputs are in the form of statements, the general form of which is

$$\text{KEYWORD (MODISF)} = \text{ID}, P_1, P_2, P_3, \ldots P_n$$

where

KEYWORD	– denotes the type of data on the card. It must be one of the specific keywords given in Table 4. It may be abbreviated using the first two letters, if desired.
MODISF	– optional code used only for modify runs. It indicates the type of change to the data from the old ISF (add, delete, or modify). See Section 2.4.5.
ID	– alphanumeric identification used to denote a specific equipment, port, wire, etc. It may be any combination of up to five letters and digits, the first character being a letter. ID is not given for some keyword types.
$P_1, P_2, \ldots, P_n$	– parameters associated with the keyword type as specified in the following sections. The number of parameters (n) is fixed for most keyword types. For others a minimum is required (Table 4). The parameters are given in the order specified for the keyword type. The parameters are numbers, alphanumeric codes, or ID's as specified.

For some keyword types, some of the parameters may be followed by a variable number of subparameters in parenthesis. The group of subparameters is counted as one parameter. For example,

$$\text{KEYWORD (MODISF)} = \text{ID}, P_1, P_2, P_3, \overbrace{(sp_1, sp_2, sp_3, \ldots)}^{P_4}, P_5$$

INPUT CARDS

```
REMARK= FILE ID=CCOT4M CORRECTED BASELINE SYSTEM.
EXEC=ISP,NEW
OU=NO
SYSTEM=AIP,0,0,0,-06,-100.
WNGRT=55,12,225,456
WGTTP=230,16,435,490
FUSLGE=165.,56.5,18.8,25.,12.,FLAT
EFQ= 1E3,100E3,1E6,100E6,1E9,4E9
OE=30,30,40,40,30,30
TE=-20,-20,5,5,-20,-20
APER=NSEWH ,0,0,86,35,50,NOW
APER=TOPCP,0,77.2,332.5,30,10,NOW
ANT=COMTA,DIPOLE,VE,(.20)
ANT=CMADF,LOOP,HZ,(.25)
ANT=TPSP,DIPOLE,VE,(.08)
ANT=PODHR,HORN,HZ,(.10,7.5,30,30,-5,90,-20)
ANT=POOMN,DIPOLE,VE,(.05)
ANT=ALTM,HORN,HZ,(.05,7.5,25,60,-4,110,-30)
FILTER=FLT01,SGTUN,1,(300.E6,1.E3,-1,-80)
FILTER=FLTR2,TRCOUP,1,(300.E6,-1,-80,200,.1)
FILTER=FLTR3,BUTTER,5,(1.075E9,.1E6,-1,-80)
FILTER=FLTR4,LOWPAS,4,(1.5F9,-1,-80)
FILTER=FLTR5,HIPAS,4,(.05E6,-1,-80)
FILTER=FLTR6,BPASS,6,(.9FE5,4.05E5,-1,-80)
FILTER=FLT07,BRJCT,10,(4.01E6,8.E6,-1,-80)
WRTBL=SPC22,UN,1,30,1,6,2.8
WRTBL=SPCS2,SH,1,30,1,6,2.8,42,8,6.6,463
WRTBL=SPCCC,DS,1,30,1,6,2.8,42,8,5.6,463,7,6.7
SUBSYS=CNI
  EQPT=UHFCO,M461,ADJUST,AFCTP,NONE,21.5,23,180
COMMENT=UHF COMM
   FREQ=30,18.E9,1,35
   PORT=CASE,0,0
     SOURCE=CASE, 30,MILSPC,SP(100.,27.5,100.E3,27.5,25.E6,52.6,100.E6,
    25,      1.E9,-24.6)
     RCEPT=CASE,10.,MILSPC,MILSPC
   PORT=COMLO,ANT,(COMTA,0,0,0,0,86,NOW),50,0,0,0,0      ,FLTR2
     SOURCE=RF, 30.,225E6,399.9E6,100.,50.E3,AM(VOICE,5.E3,1),(-50,-100)
     RCEPT=RF, 30.,225E6,399.9E6,-100 ,50.E3,AM(VOICE,5.E3,0),1.E6
   PORT=COMUP,ANT,(COMTA,0,0,0,138,625,NOW),50,0,0,0,0   ,FLTR1
     SOURCE=RF, 30.,225E6,399.9E6,100.,50.E3,AM(VOICE,5.E3,1),(-50,-100)
     RCEPT=RF, 30.,225E6,399.9E6,-100,50.E3,AM(VOICE,5.E3,0),1.E5
   PORT=ADFIN,ANT,(CMADF ,0,0,0,0,129,NOW),50.0,0,0,0     ,0
     RCEPT=RF, 30.,225E6,399.9E6,-100,50.E3,AM(VOICE,5.E3,0),1.E5
   PORT=PWRSP,WIRE,(BNDL1,P1W1,A1,GND,NONE,EX),.5,0,0,0,0    ,0
     SOURCE=POWER,30,115,400,2,1,M461A
     RCEPT=POWER,30,115,400,2,1,M461A
   PORT=AIDOT,WIRE,(BNDL2,B2W2,A2,GND,NONE,NOTEX),50,0,0,0,0   ,0
     SOURCE=SIGNAL, 30.,20.E3,4.E6,RECTPL( 20.E3,1.E-6),10,VLTS,4.E6
   PORT=PYCON,WIRE,(BNDL2,B2W1,A2,GND,GND,EX),50,0,0,0,0,0
     SOURCE=SIGNAL,30,20.E3,5.E6,RECTPL(1.E3,.2E-3),10,VLTS,4.E6
     RCEPT=SIGNAL,30,20.E-12,5.E6,RECTPL(1.E3,.2E-3),10,VLTS,4.E5
COMMENT=TACAN
  EQPT=TACAN,M61810,ADJUST,CNIRY,NOT,-3,15,175
   FREQ=30,18.E9,1,35
   FQTBL=900.E6,962.E6,1025E6,1130.E6,1213.E6,1280.E6,1380E6
   PORT=CASE,0,0
     SOURCE=CASE,30,MILSPC,MILSPC
     RCEPT=CASE, 30,MILSPC,MILSPC
   PORT=TACRF,ANT,(COMTA,0,0,0,80,375,NOW),50,0,0,0,0    ,FLTR3
     SOURCE=RF, 30,1025.E6,1130E6,1500,572E3,RADAR(RECTPL,30,2.5E-6),(-50,-80)
```

FIGURE 2
DATA INPUT EXAMPLE

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TABLE 4 KEYWORDS

KEYWORD	MAXIMUM NO. OF ENTRIES	NO.* PARAMETERS	CARD FORMAT IN SECTION	DESCRIPTION
ANT	50/RUN	4	2.3.4.2	Antenna common model
APER	10/RUN	7	2.3.4.1	Aperture common model
BPTS	1/BUNDLE	≥ 8	2.3.6.2	Bundle end points
BSEG	1/BUNDLE	≥ 5	2.3.6.3	Bundle segment
BUNDLE	10/RUN	1	2.3.6.1	Bundle header
COMMENT	-----	-	2.3.2.3	General comment
EFQ	1/RUN	≥ 2	2.3.3.4	Environmental field frequencies
EODATA	1/RUN	0	2.3.8	End of data
EQPT	40/RUN	8	2.3.5.2	Equipment header
EXEC	1/RUN	≥ 1	2.3.2.1	Execution control
FILTER	20/RUN	4	2.3.4.3	Filter common model
FQTBL	1/EQPT	≥ 1	2.3.5.3	User frequencies in table
FREQ	1/EQPT	3	2.3.5.3	Frequency table parameters
FUSLGE	1/RUN	6	2.3.3.2	Fuselage
IEFL	1/RUN	≥ 2	2.3.3.4	Internal environmental field
LIST	1/RUN	2	2.3.2.4	List control
OEFL	1/RUN	≥ 2	2.3.3.4	Outside environmental field
OUTPUT	1/RUN	≥ 1	2.3.2.4	Output control
PORT	15/EQPT	≥ 1	2.3.5.4	Port data
REMARK	5/RUN	1	2.3.2.2	General remarks
RCEPT	1/PORT	≥ 4	2.3.5.5	Receptor spectrum parameters
SOURCE	1/PORT	≥ 4	2.3.5.5	Source (emitter) spectrum parameters
SUBSYS	≥ 1	1	2.3.5.1	Subsystem header
SYSTEM	1/RUN	6	2.3.3.1	System and basic run parameters
TITLE	2/RUN	1	2.3.2.2	Run title
WAIVER	50/RUN	≥ 9	2.3.7	Waiver analysis data
WGTIP	1/RUN	4	2.3.3.3	Wing tip coordinates
WIRE	50/BUNDLE	≥ 4	2.3.6.4	Wire data for bundle
WNGRT	1/RUN	4	2.3.3.3	Wing root coordinates
WRTBL	20/RUN	≥ 7	2.3.4.4	Wire characteristics table

* NOTE: "≥" indicates a minimum number. Otherwise the exact number of parameters must be given.

in which the subparameter group counts as one parameter (P_4) so that the total number of parameters is 5. An error results if an incorrect number of parameters is given. Zero or a valid code must be given for unused parameters as placeholders. (See Rule 6, Section 2.4.1)

As an example use of the input format, consider the keyword type FUSLGE as defined in Section 2.3.3. Assume the values to be specified are as follows:

Conical nose limit	= 165.0
Fuselage radius	= 56.5
Core radius	= 18.8
Centroid water line	= 25.0
Bottom water line	= 12.0
Type of cylinder bottom	= FLAT

The resulting IEMCAP input card would contain

FUSLGE = 165, 56.5, 18.8, 25, 12, FLAT

(If not given, the decimal point is assumed to the right of the number.) Complete rules for the input are given in Section 2.4.

Certain keywords, such as FUSLGE, are used only once in a run; and others, such as ANT, may occur several times. For discussion purposes, the first is called a single entry keyword, and the second is called a multiple entry keyword. Every multiple entry keyword has an ID associated with it, either explicitly or implicitly. An ID is explicitly given when it appears after the equals sign on the card itself. All ID's are explicitly given except for certain hierarchical data where the ID is implicitly given by the proceeding card or cards. Certain keyword cards, such as the equipment cards, have both an explicit ID (the equipment ID) and an implicit ID (the subsystem ID). Some keywords have more than one implicit ID. For example, a PORT card has two implicit ID's (the equipment ID and the subsystem ID) as well as an explicit ID (the port ID). Both types of ID play an important part in the modification process. In general, data given in order of the heirarchy have as implicit ID's those of the preceding higher level ID's.

The card formats associated with all keyword types are described in the following sections. The general form for each is given along with the parameters and subparameters to be supplied. The following convention is used below in describing them:

CAPITOL LETTERS - user-supplied alphanumeric ID

UNDERLINED CAPITOL LETTERS - one of the specific alphanumeric codes given

small letters - numeric value

2.3.2 Control and Identification Cards

The EXEC, TITLE, and REMARK cards must precede all other input cards. Of these, the EXEC card is mandatory for all runs.

2.3.2.1 Execution Control Card (EXEC) - This card controls the tasks to be
performed and the type of data input. It must precede all other input data
cards except the TITLE and REMARK card. See Section 3.1.1 for guidance in
specifying this card. If the optional parameters are omitted, the default
code is assumed. The card format is as follows:

EXEC = TASK, JOBSTATUS, CTASK, CERR

TASK -- Analysis task (required)
    ISP - Input and Spectrum Processing only. Input data is decoded
          and checked for errors, and initial spectra are computed and
          printed. No working files are written.
    SGR - Specification Generation Routine in TART to be used.
    CEAR- Comparative EMI Analysis Routine in TART to be used.

JOBSTATUS - Job status and input description. (Optional if CTASK is
            not given. If omitted NEW is assumed.)
    NEW - new job. Data is from cards only (default)
    OLD - old job. Data is from old ISF or PIF.
    MOD - modification job. Data from old ISF or PIF is to
          be modified by card input.

CTASK - depends on TASK and JOBSTATUS
    - If TASK is ISP and JOBSTATUS is NEW, CTASK is not given.

    - If TASK is ISP and JOBSTATUS is OLD or MOD, CTASK specifies the
      type of input file:
      1SF - input file is an Intrasystem Signature File
      SU - input is special user (from a Processed Input File).

    - If TASK is SGR, CTASK is not given.

    - If TASK is CEAR, CTASK specifies the subtask:
      TO - trade-off analysis
      WAIVER - waiver analysis
      SURVEY - baseline system EMC survey

CERR - If given, cancels the normal error hault after input decode even
       though the data contains errors. IDIPR will continue into
       initial processing in spite of the errors. This is permitted
       only if TASK is ISP.

    CE - Cancel error hault.

2.3.2.2 Title and Remark Cards - These two optional cards supply identifica-
tion and additional information on the printed output and the permanent files.
To give the user control over their printout, they are the only fixed field
cards in the IDIPR input. For both types, the keyword must start in column 1
and the title or remark must start in column 8. Up to two TITLE and five
REMARK cards are permitted.

COLUMN

1   8

TITLE = title data

REMARK = remark

2.3.2.3 Comment Card -

COMMENT = comment

The comment card is an optional card that allows the user to insert comments into the data. It will be printed in the list of input data only and will not be saved for the report. Comments desired to appear on the report and ISF file should be inserted through the REMARKS card. Any number of comment cards may be inserted anywhere in the data.

2.3.2.4 Output Control Cards - The following optional cards give output options. If not given, the default code is assumed.

List Card -

LIST = NISF, OISF

NISF

   NONEW - Do not print report of new ISF.

   NEW   - Print a report of the new ISF (default).

OISF

   OLD   - Print a report of the old ISF before modification.

The LIST card is optional. If no LIST card is present, the new ISF report will be listed and the old ISF report will not be. The input data cards are always listed.

Output Card -

OUTPUT = ISFILE, SPOUT, ISDBUG

ISFILE

   NOISF - Do not create a new ISF (default)

   ISF   - Create a new ISF

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SPOUT

    SP   - Supplemental printout from TART transfer models is desired.

    NO   - None desired.

    NOTE: This specification is overridden in TART. (See Section 2.4.9.)
           Use as placeholder when using the ISDBUG option.

ISDBUG

    IS   - IDIPR special debug. This will cause flags, data and messages
               to be printed. Its purpose is strictly debug; the data is
               unformatted and is generally meaningful only by following
               a source listing of IDIPR.

OUTPUT is an optional card. Unless included, a new ISF will be created
for the run. For SGR and CEAR runs, a new ISF will be generated regardless
of the specification on the OUTPUT card as the ISF supplies the system data
to TART.

2.3.3 System Data

This data defines the physical system and specifies basic analysis param-
eters applying to the entire system. For ground stations, a coordinate sys-
tem is used with the origin at a specified reference point. All antenna
locations, box locations, wire routing points, etc., are given in X, Y, Z co-
ordinates relative to this point. Aircraft and spacecraft coordinates are in
the butt line (bl), water line (wl), and fuselage station (fs) system common-
ly used for aerospace vehicles. As illustrated in Figure 3, butt line is the
horizontal distance to the right (positive) or left (negative) from the
vehicle centerline, water line is the vertical distance from the vehicle
bottom, and fuselage station is the lengthwise distance from the nose (posi-
tive toward the tail). The origin of this coordinate system may vary from
vehicle to vehicle. In all cases, coordinates are given of the center of the
box, antenna, aperture, etc. being located.

2.3.3.1 System and Basic Analysis Parameter Card -

        SYSTEM = TYPE, long., lat., alt., asm, empl

1. TYPE = AIR - Aircraft model (conical nosed cylinder with wings).

        Ground, (sigma, epsr) - Ground station. Antennas are over a
        finitely conducting ground plane as defined by the subparam-
        eters:

        sigma - conductivity relative to copper
        epsr - permittivity relative to free space

        SPACE - Spacecraft model (same as aircraft but without wings).

2. longitude ⎫   Reference point coordinates   degrees
                 for ground stations. All
3. latitude ⎬   other systems must specify   degrees
                 C's as a placeholder.
4. altitude ⎭   feet

5. asm – adjustment safety margin for SGR. Spectra are   dB
       adjusted so that EMI margins are less than or
       equal to asm.

6. empl – EMI margin print limit. Cases in which the   dB
       maximum EMI margin exceeds empl are printed
       in the TART output.

NOTE: asm and empl can be overridden in TART. See Section 2.3.9.

2.3.3.2 Fuselage Model Parameter Card

2.3.3.2 Fuselage Model Parameter Card – This card is supplied only if
TYPE = AIR or SPACE on the SYSTEM card. It defines the fuselage parameters
used for antenna propagation calculations for which a flat or round bottomed
cylindrical model is used to approximate the vehicle shape. A visualization
of the flat bottomed model fitted to an F-4 aircraft is shown in Figure 3.
The model is divided into fixed and variable radius regions with the dividing
point at fs_n, as shown. If one or both antennas are in the fixed cylinder
region, cylindrical spirals are used to compute antenna separation and fuse-
lage shading. If both antennas are in the variable radius region, separation
is calculated by a conical spiral fitted between the locations of the two
antennas. The cone will vary depending on the radii of the two antennas.
The card format follows:

$$FUSLGE = fs_n, \; \rho_f, \; \rho_c, \; wl_c, \; wl_{BOT}, \; \underline{MDL}$$

1. fs_n – FS of variable radius region limit, as discussed   inches
           above.

2. ρ_f – Fuselage radius (radius of fixed cylinder). A   inches
           10 percent variation from ρ_f is included in the
           mathematical model to allow for contours in the
           vehicle shape. That is, if the radius from the
           centroid to a given antenna is within 10 percent
           of ρ_f, it is considered on the fuselage. For
           aircraft, the default value using the wing root is
           computed if this parameter specified as zero. It
           must not be zero for spacecraft.

3. ρ_c – Core Radius. To prevent inaccuracies resulting   inches
           from very small radii in computing fuselage
           shading, a cylindrical core is defined. Antennas
           within this core are assumed at the centroid with
           no fuselage shading computed to them. If speci-
           fied as zero, a default value of 1/3 of the fuse-
           lage radius is used.

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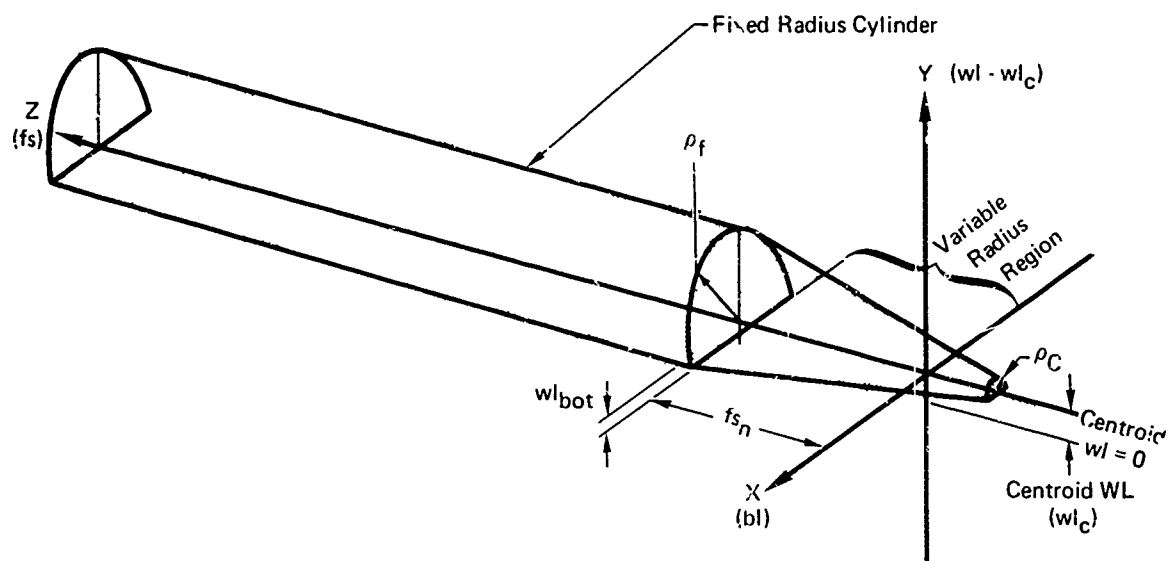
**FIGURE 3
BASIC FUSELAGE PARAMETERS
(FLAT BOTTOMED CYLINDER)**

GP74 0267 113

4. wl_c – Water line of the cylinder centroid.   inches

5. wl_{BOT} – Water line of bottom when flat-bottomed cylinder   inches
         is used

6. <u>MDL</u>   – Cylindrical model

       ROUND – round bottomed cylinder
       FLAT – flat bottomed cylinder

2.3.3.3   <u>Wingroot and Wingtip</u> – Supplied only if <u>TYPE</u> = AIR.   See Figure 4.

$$WNGRT = bl, wl, fs_f, fs_a$$

$$WGTIP = bl, wl, fs_f, fs_a$$

1. bl   butt line of root/tip   inches

2. wl   water line of root/tip   inches

3. fs_f fuselage station of forward edge of root/tip   inches

4. fs_a fuselage station of aft edge of root/tip   inches

2.3.3.4   <u>Environmental Electromagnetic Fields</u> – These are optional inputs
defining levels of the ambient fields both outside and inside the system.
Wire segments exposed by apertures in the system structure and antennas are
presumed exposed to the external fields. Equipment cases and wire segments
which do not run by apertures are exposed to the internal fields. The fields
are specified by giving the levels at up to 90 sample frequencies. The pro-
gram log-linearly interpolates between these levels. The EFQ statement estab-
lishes the frequencies, while the OEFL and IEFL give the levels at these fre-
quencies. Either OEFL, IEFL, or both may be present; but if either is present,
EFQ must be. The same number of levels must be specified as frequencies in
EFQ. If the external field only is specified, the internal field defaults to
40 dB less than the external field. If the internal field only is specified,
the external field defaults to 40 dB greater than the internal field. If
neither is specified, external and internal fields are presumed zero.

$$EFQ = f_1, f_2, f_3, \cdots f_n$$

$$IEFL = e_{i1}, e_{i2}, e_{i3}, \cdots e_{in}$$

$$OEFL = e_{01}, e_{02}, e_{03}, \cdots e_{on}$$

EFQ   – frequencies   Hz
IEFL – internal field levels   dB V/m
OEFL – outside field levels   dB V/m
n   – number of sample points
         $(1 \leq n \leq 90)$

(Horizontal Plane)

1 0996 6
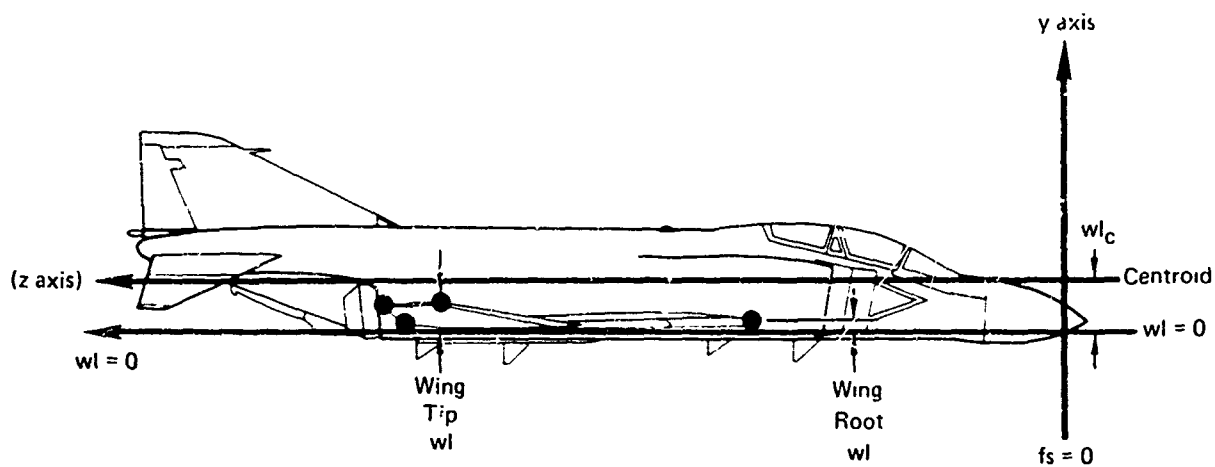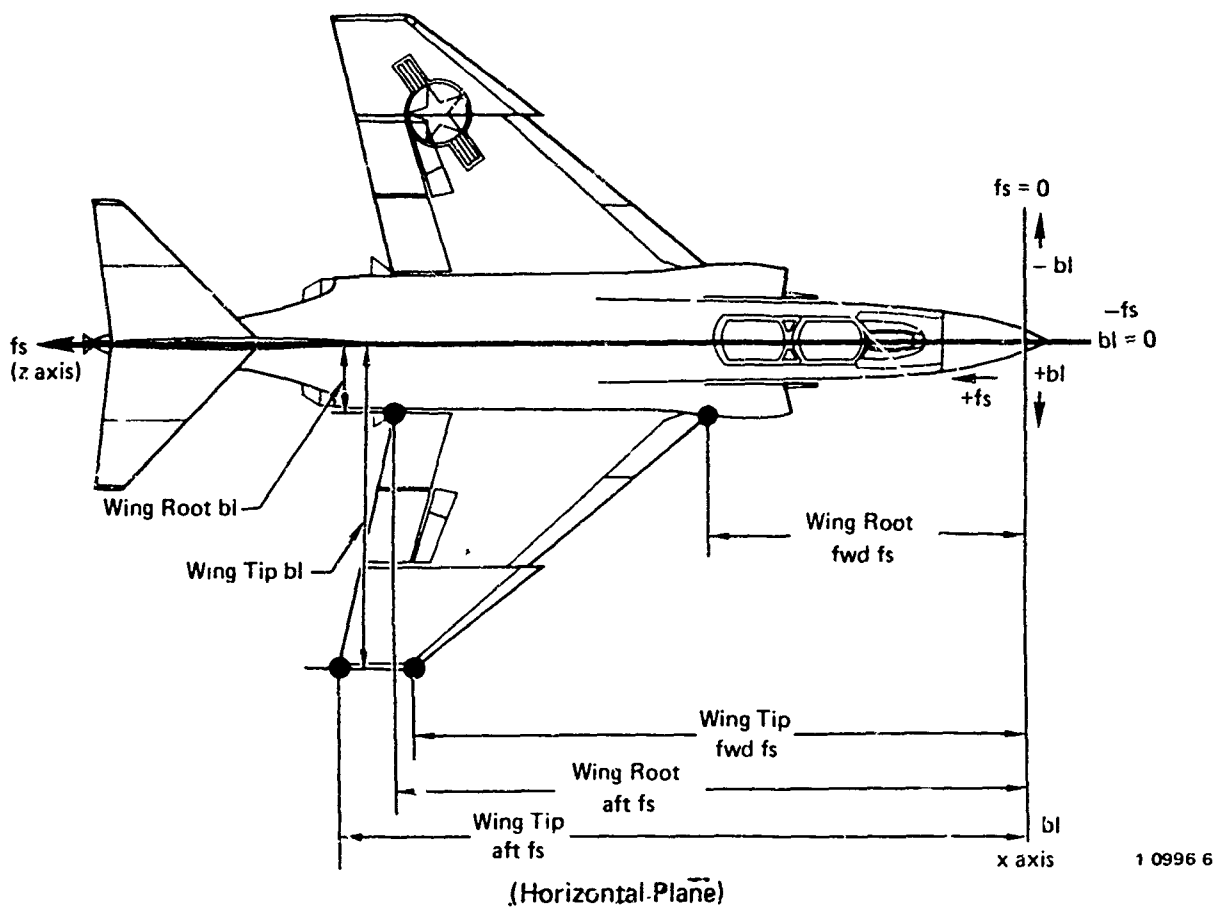
(Vertical Plane)
FIGURE 4'
WING POINT LOCATION

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2.3.4 Common Model Parameters

This data specifies parameters for apertures, antennas, filters, and wire characteristics used throughout the system. Basic parameters are given for each type of aperture, antenna, filter, and wire used in the system, as well as a unique ID. These ID's are referenced in the subsystem and wire bundle data as many times as desired. These are multiple entry keywords as discussed in Section 2.3.1.

2.3.4.1 Apertures

2.3.4.1 Apertures - These are dielectric apertures which expose wire bundle segments to external electromagnetic energy from antennas and environmental fields. For segments which are exposed over their entire length, the aperture length should be greater than or equal to the segment length. Field-to-wire coupling will be computed only for aperture-exposed wires.

$$\text{APER} = \text{APID, wl, bl, fs, width, length, } \underline{\text{WGLOC}}$$

1.	APID	= aperture identification	ALPHA ID
2.	bl	= butt line for aircraft or spacecraft	inches
		= x for ground	inches
3.	wl	= water line for aircraft or spacecraft	inches
		= y for ground	inches
4.	fs	= fuselage station for aircraft or spacecraft	inches
		= z for ground	inches
5.	width	= width of aperture	inches
6.	length	= length of aperture	inches
7.	WGLOC	= wing location	ALPHA code

NOW	= not on wing or system is not aircraft
BOT	= on or suspended from wing bottom
TOP	= top of wing
FWDEDG	= forward edge of wing
AFTEDG	= aft edge of wing
TIP	= tip of wing

2.3.4.2 Antenna Data - Main beam and side lobe limit angles are defined in the spherical angles commonly used for antennas, as illustrated in Figure 5. Elevation angle θ is the vertical depression down from the y-axis, and azimuth angle ϕ is determined clockwise from the negative z-axis. The location and main beam orientation is specified in the port data referencing AID. The subparameters required depend on the MODEL code.

$$\text{ANT} = \text{AID, } \underline{\text{MODEL}}. \; \underline{\text{POLAR}}, \; (sp_1, \; sp_2, \; ..)$$
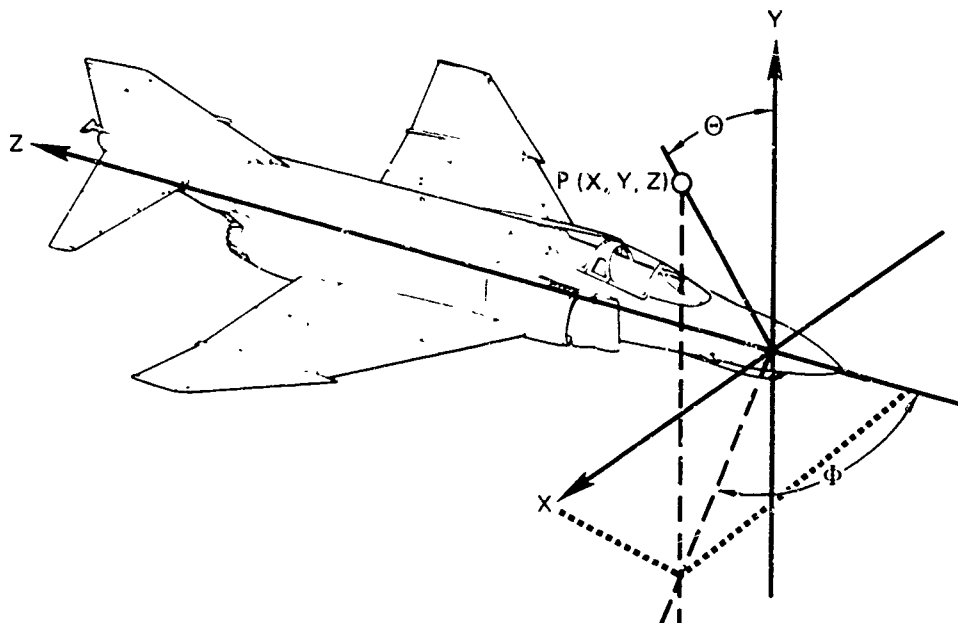
FIGURE 5
LOOK-ANGLE Θ AND Φ IN SPHERICAL COORDINATE SYSTEM
FROM AN ANTENNA AT ORIGIN TO P (X, Y, Z)

1. AID identification   ALPHA ID

2. MODEL code   DESCRIPTION   SUBPARAMETERS $(sp_1, sp_2, \ldots)$

        DIPOLE   dipole ℓ

        WHIP   whip ℓ

        SLOT   slot ℓ

        LOOP   loop   d

        PARDSH   parabolic dish $d, G_{mB}, \theta_B, \phi_B, G_{msL}, \phi_{s1}, G_{Bl}$

        LGPER   log periodic $d, G_{mB}, \theta_B, \phi_B, G_{msL}, \phi_{s1}, G_{Bl}$

        HORN   horn $d, G_{mB}, \theta_B, \phi_B, G_{msL}, \phi_{s1}, G_{Bl}$

        PSDAR   phased array $d, G_{mB}, \theta_B, \phi_B, G_{msL}, \phi_{s1}, G_{Bl}$

        SPIRAL   spiral $d, G_{mB}, \theta_B, \phi_B, G_{msL}, \phi_{s1}, G_{Bl}$

    Definition of subparameters

    ℓ = antenna length   inches

    d   = largest antenna dimension   inches

    G_{mB} = maximum gain   dB

    θ_B = 3-dB vertical half-beamwidth   degrees

    ϕ_B = 3-dB azimuthal half-beamwidth   degrees

    G_{msL} = major side-lobe gain   dB

    ϕ_{s1}* = side lobe angle   from ϕ_B to
                                                                 180 degrees

    G_{Bl}*   = back lobe gain   dB

*NOTE: Set equal to zero if not used.

3. POLAR = polarization   ALPHA code

    HZ – horizontal
    VE – vertical
    CI – circular

2.3.4.3 <u>Filter Data</u> - These are filters connected between a port and its source or load. It is referenced in the port data.

$$\text{FILTER} = \text{FID}, \underline{\text{TYPE}}, \begin{Bmatrix} \text{no. stages/} \\ \text{order} \end{Bmatrix}, \quad (sp_1, sp_2 \ldots)$$

1. FID - filter identification   ALPHA ID

2. TYPE - type of filter

TYPE	DESCRIPTION	SUBPARAMETERS
SGTUN	single tuned stage	f_o, B, γ, isol
TRCOUP	transformer coupled stage	f_o, γ, isol, Q, m
BUTTER	Butterworth tuned	f_o, B, γ, isol
LOWPAS	low pass	f_u, γ, isol
HIPAS	high pass	f_λ, γ, isol
BPASS	band pass	f_ℓ, f_u, γ, isol
BRJCT	band reject	f_ℓ, f_u, γ, isol

3. No. Stages - number of stages if <u>TYPE</u> = SGTUN, TRCOUP, BUTTER
   or
   Order   - order if <u>TYPE</u> = LOWPAS, HIPAS, BPASS, BRJCT

4. Subparameters

f_o	tuned frequency	MHz
B	bandwidth	MHz
γ	insertion loss	dB
isol	max isolation	dB
Q	circuit Q	nondimension
m	circuit coupling factor	nondimension
f_u	upper break point	MHz
f_ℓ	lower break point	MHz

2.3.4.4 Wire Characteristics Table - These cards define a table of general wire characteristics which are referenced for specific wires in the wire bundle data. There are three input forms:

for unshielded wires -

$WRTBL = WTDID, \underline{UN}, n_{wt}, d_c, \sigma_c, t_i, \epsilon$

for single shielded wires -

$WRTBL = WTDID, \underline{SH}, n_{wt}, d_c, \sigma_c, t_i, \epsilon, d_{s1}, t_{s1}, t_j, C_{cs}$

for double shielded wires -

$WRTBL = WTDID, \underline{DS}, n_{wt}, d_c, \sigma_c, t_i, \epsilon, d_{s1}, t_{s1}, t_j, C_{cs}, d_{s2}, t_{s2}$

1.	WTDID	Wire Type Designation ID	ALPHA ID
2.	$\underline{UN}/\underline{SH}/\underline{DS}$	Shield Code	ALPHA code
		SH shielded	
		UN unshielded	
		DS double shield	
3.	n_{wt}	number of wire pairs twisted	integer
4.	d_c	conductor diameter	mils
5.	σ_c	conductor conductivity	rel/copper
6.	t_i	insulation thickness	mils
7.	ϵ	insulation dielectric constant	rel/free space
8.	d_{s1}	shield internal diameter (inner shield if DS)	mils
9.	t_{s1}	shield thickness (inner shield if DS)	mils
10.	t_j	shield jacket thickness (inner shield if DS)	mils
11.	C_{cs}	shield-to-conductor capacitance (to inner shield if DS)	pF/ft
12.	d_{s2}	outer shield internal diameter	mils
13.	t_{s2}	outer shield thickness	

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2.3.5 Subsystem Data

This data gives specific parameters down to the port source and receptor level. The cards must be given in order of the heirarchy: subsystem, equipment, port, source/receptor.

2.3.5.1 Subsystem card -

        SUBSYS = SSID

        SSID   Subsystem identification   ALPHA ID

2.3.5.2 Equipment -

        EQPT = EID, SPEC, FIXADJ, COMP, CLASS, bl, wl, fs

1. EID   identification   ALPHA ID

2. SPEC   EMC spec to be used as base   ALPHA code
        M461A   MIL-STD-461A
        M6181D   MIL-I-6181D

3. FIXADJ   fixed or adjustable EMC limit   ALPHA code
        FIX   fixed EMC limit
        ADJUST   adjustable EMC limit

    NOTE: If ADJUST is used, the nonrequired spectra are
            adjustable by SGR to the limit defined on the
            source or RCPT card. If FIX is used, the
            spectra are not to be adjusted. Such would be
            the case for existing equipment for which the
            EMI specification limits are already defined.

4. COMP   compartment ID   ALPHA ID

    NOTE: This defines an RF tight compartment in which
            the box is located. Case to case coupling
            will be computed only for boxes with the same
            compartment ID.

5. CLASS   security classification   ALPHA code

        NOTCLS   not classified, unclassified
        CONF   confidential
        SECRET   secret
        TOPSEC   top secret

6. bl   = but⁝ line (aircraft, spacecraft) or   inches
        x coordinate (ground station) of center of
        box location

7. wl   = water line (aircraft, spacecraft) or   inches
        y coordinate (ground station) of center of
        box location

8. fs   = fuselage station (aircraft, space-   inches
        craft or
        z coordinate (ground station) of center of
        box location

2.3.5.3 Spectrum Sample Frequency Table Data - These cards define the table of sample frequencies applicable for all port spectra within a given equipment. That is, the port spectra will be stored as maximum emission and minimum susceptibility levels occurring in the interval half way between each sample frequency and its upper and lower neighboring frequencies. (See Volume I of this manual for a complete discussion of this.) There are two cards used to define the frequency table. Either or both may be given.

The FREQ card gives basic parameters:

$$\text{FREQ} = f_\ell, \ f_h, \ n_{f_o}, \ n_{fmax}$$

f_ℓ lowest frequency to be considered   Hz
        (default = 30 Hz)

f_h highest frequency to be considered   Hz
        (default = 18 GHz)

n_{f_o} number of frequencies per octave
        (default = 3)

n_{fmax} maximum number of frequencies in
        spectra (up to 90 and greater than
        number in FQTBL if given -
        default = 90)

Use of this card alone causes a table of up to n_{fmax} geometrically spaced frequencies to be generated from f_ℓ to f_h with n_{f_o} frequencies per octave. A nonfatal error will result if more than n_{fmax} frequencies are required to cover the specified frequency range, and the program will use the first n_{fmax} frequencies generated. If the FREQ card is omitted, the default values are assumed.

Parameters f_ℓ and f_h define the general frequency range. The specific frequency range is defined by the program for each port depending on the <u>SR</u> code on the SOURCE or RCEPT card.

The FQTBL card allows specific frequencies to be included in the table:

$$FQTBL = f_1, f_2, \ldots f_n$$

$f_1, f_2, \ldots$ user specified frequencies
$(1 \leq n \leq n_{fmax})$

Use of this card causes a table of $n_{fmax} - n$ geometrically spaced frequencies to be generated from f_ℓ to f_h (n_{f_0} is ignored). The n user frequencies are then inserted in the table at the appropriate places.

2.3.5.4 <u>Port Data</u> - These cards give the connection, filter, termination impedance, and initial nonrequired spectrum displacement data. The first port in each equipment must be the equipment case (i.e. leakage through the case). The form for the case is:

      PORT = CASE, sdfs, sdfr (a case must be both a source and a receptor)

All other ports follow, and are analyzed in the order given. The format for these PORT cards is:

    PORT = PID, <u>CONN. CODE</u>, $(sp_1, sp_2, \ldots)$, r_ℓ, c_ℓ, ℓ_ℓ, sdfs, sdfr, FID

1. PID   port identification   ALPHA ID

     PID   user supplied port ID

     CASE   the equipment case is specified as a port with CASE as the ID; user will supply spectrum

2. <u>CONN. CODE</u>   connection code   ALPHA code

     ANT   antenna
     WIRE   wire

3. If <u>CONN. CODE</u> = WIRE, the subparameters are:

     (BID, WID, PTID, <u>RETURN</u>, <u>SH. TERM</u>, <u>APEXP</u>)

     BID   bundle ID (See 2.3.6.1)   ALPHA ID
     WID   wire ID (See 2.3.6.4)   ALPHA ID
     PTID   point ID (See 2.3.6.2)   ALPHA ID

       <u>NOTE</u>: All ID's must match ID's in bundle data.

     <u>RETURN</u>   return path of signal   ALPHA code

       UNBAL   unbalanced (wire return, unbalanced circuit)
       BAL   balanced   (wire return, balanced circuit)
       SHD   own shield
       GND   ground

No abbreviation of first two characters is permitted on the REFWIRE alpha codes.

SH. TERM	shield termination	ALPHA code

NONE	blank	
OPN	open $\Big\}$ single shield	
GND	ground	
OO	open open	
OG	open ground $\Big\{$ double shield	
GO	ground open $\Big\{$ (inner shield first)	
GG	ground ground	

APEXP	aperture exposed wire	ALPHA code

NOTEX	not exposed
EX	exposed

If CONN. CODE = ANTENNA, the subparameters are:

$$(AID, \; \theta_o, \; \phi_o, \; c_1, \; c_2, \; c_3, \; WGLOC)$$

AID	antenna ID (Must match one table ID. See 2.3.4.2)	
θ_o	main beam peak coordinates, vertical "look" angle	degrees
ϕ_o	main beam peak coordinates, azimuthal "look" angle	degrees
c_1	butt line for aircraft or spacecraft of antenna location x – coordinate for Ground	inches
c_2	water line for aircraft or spacecraft of antenna location y – coordinate for Ground	inches
c_3	fuselage station for aircraft or spacecraft of antenna location z – coordinate for Ground	inches
WGLOC	wing location	ALPHA code
NOW	not on wing (use also if system is spacecraft or ground)	
BOT	on or suspended from wing bottom	

TOP	top of wing	
FWDEDG	forward edge of wing	
AFTEDG	aft edge of wing	
TIP	tip of wing	

4. r_ℓ termination resistance* Ohms

5. c_ℓ termination capacitance* Farads

6. ℓ_ℓ termination inductance* henries

*NOTE: See Figure 6 for impedance configuration. At least one parameter (r_ℓ, c_ℓ, or ℓ_ℓ) must be nonzero.

7. sdfs initial spectrum displacement dB
factor for source (0 if not source
port). Added to spectrum level.

8. sdfr initial spectrum displacement dB
factor for receptor (0 if not recep-
tor port). Subtracted from spectrum
level.

9. FID filter identification (Must match ALPHA ID
an ID of a filter given in the
filter table. See Section 2.3.4.3)

2.3.5.5 Source and Receptor Data - These cards, which follow the PORT card, define the type, adjustment limit, and spectrum parameters. A port is designated as a source, a receptor, or both depending whether the SOURCE, RCEPT, or both cards are present. (At least one of them must be present.) If both are present, they can be in either order. The general format of these cards is

$$\text{SOURCE} = \underline{SR}, \; P_1, \; P_2, \; \cdots$$

$$\text{RCEPT} = \underline{SR}, \; P_1, \; P_2, \; \cdots$$

$\underline{SR}$	source/receptor type code	ALPHA code
RF	radio frequency	
POWER	AC & DC power leads	
SIGNAL	signal	
CNTROL	control	
EED	electro-explosive device	
CASE	equipment case	

$P_1, P_2, \cdots$ parameters and subparameters on $\underline{SR}$ as described below

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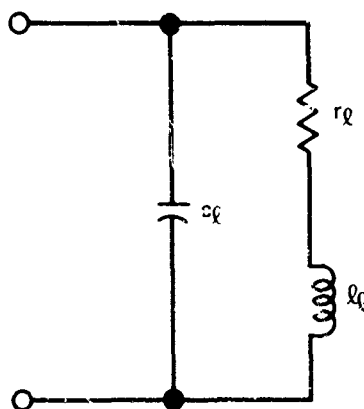
FIGURE 6
PORT TERMINATION IMPEDANCE CONFIGURATION

The SR codes must be the same on the SOURCE and RCEPT cards for the same port.

The specific format for these cards varies with the SR code. Each of these formats is discussed below.

2.3.5.5.1 Radio Frequency --

SOURCE = RF, adjlim, f_ℓ, f_h, p, bwc, MODSIG, (sp_1, sp_2, ...),

(h_2, h_3, ...)

RCEPT = RF, adjlim, f_ℓ, f_h, s, bwc, MODSIG, (sp_1, sp_2, ...), f_{if}

1.	RF	Radio frequency SR code	ALPHA code
2.	adjlim	Adjustment limit displacement from the initial spectrum level. (SGR can adjust the spectrum this number of dB from its initial amplitude. Must be positive.)	dB
3.	f_ℓ	lowest carrier frequency *	Hz
4.	f_h	highest carrier frequency *	Hz
5.	p	maximum output power (source)	watts
6.	s	minimum sensitivity (receptor)	dBm
7.	bwc	bandwidth of channel (6 dB width)	Hz
8.	MODSIG	modulation/signal code (see below)	ALPHA code
9.	(sp_1, sp_2, ...)	subparameters depending on MODSIG (see below)	
10.	(h_2, h_3, ...)	harmonic displacement level relative to fundamental for the 2nd, 3rd, ... up to 10th. Specify as many as necessary up to highest significant.	dB

* Note: $f_\ell = f_h$ if non-tunable.

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11. f_{if} intermediate frequency; negative   Hz
                        if below tuned frequency, positive
                        if above tuned frequency

The required frequency range of an RF port is set from f_ℓ to f_h plus or minus half of bwc except where the modulation spectrum is user-specified. In this case the required range includes the user frequencies.

If <u>MODSIG</u> is CW, there are no subparameters and the first parenthesis are omitted. For sources, follow CW by harmonics:

SOURCE = RF, adjlim, f_ℓ, f_h, p, bwc, CW, $(h_2, h_3, ...)$

RCEPT = RF. adjlim, f_ℓ, f_h, s, bwc, CW, f_{if}

If the harmonics are not specified, a zero must signify the omission:

SOURCE = RF, adjlim, f_ℓ, f_h, p, bwc, <u>MODSIG</u>, (sp_1, sp_2), (0)

The <u>MODSIG</u> codes and required subparameters for each are as follows:

<u>MODSIG</u>	<u>Description</u>	<u>Subparameters</u>
CW	continuous wave	none (see above)
PDM	pulse duration modulation	r_b
NRZPCM	NRZ pulse code modulation	r_b
BPPCM	biphase pulse code modulation	r_b, em
PPM	pulse position modulation	r_b, t
TELEG	conventional telegraph	wpm, ftone
FSK	frequency-shift keying	r_b, diff
PAMFM	pulse amplitude modulation	df
RADAR	radar (pulsed RF)	<u>PTYPE</u>, other subparameters as follows: RECTPL, r_b, t TPZD, r_b, t, t_r, t_f COSQD, r_b, t GAUSS, r_b, t CHIRP, r_b, t, tr, tf, pcr
AM	amplitude modulation	<u>SIG</u>, b, em

DSBSC	double side bana suppressed carrier	$\underline{SIG}$, b	
LSSB	single side band, lower	$\underline{SIG}$, b	
USSB	single side band, upper	$\underline{SIG}$, b	
FM	frequency modulation	$\underline{SIG}$, b, df	
LOLKG	local oscillator leakage from receivers	lo_{nb}, lo_{bb}	
SPECT	user supplied modulation spectrum	f_1, g_1, f_2, g_2, $\ldots$, f_n, g_n $(2 \leq n \leq 10)$	

Where the subparameters are defined as follows:

Subparameter	Description	Units
r_b	bit rate or pulse repetition	bits/sec
t	pulse width	sec
wpm	words per minute	
ftone	tone frequency (zero if no tone)	Hz
diff	difference between upper and lower oscillator frequencies	Hz
df	maximum frequency deviation from carrier	Hz
$\underline{PTYPE}$	pulse type	ALPHA CODE
RECTPL	rectangular	
TPZD	trapezoid	
COSQD	cosine squared	
GAUSS	Gauss	
CHIRP	chirp	
t	pulse width	sec
t_r	rise time	sec
t_f	fall time	sec

Subparameter	Description	Units
pcr	pulse compression ratio (neg. if frequency deviation is negative)	none
SIG	signal type code	ALPHA code
VOICE	voice	
CVOICE	clipped voice	
NONVCE	telegraphy digital	
em	modulation index if AM	
b	if non voice, bandwidth (6 dB)	Hz
lo_{nb}	initial narrowband local oscillator leakage	dBm
lo_{bb}	initial broadband local oscillator leakage	dBm/MHz
$f_1, f_2, \ldots, f_n$	User modulation frequencies (relative to carrier freq)	Hz
$g_1, g_2, \ldots g_n$	User modulation spectrum levels where $2 \le n \le 10$ (Receptor spectra are input in dBm)	dBm/MHz

User-supplied modulation spectrum frequencies are relative to the carrier. That is, negative frequencies are below the carrier, and positive are above. The user spectrum is quantized to the equipment frequency table using the maximum in the interval for emitters and minimum for receptors as with any other spectrum. This allows changing the table without having to change the port data.

2.3.5.5.2 Power Lines —

SOURCE = POWER, adjlim, v, f, nh, nphase, RS, (sp_1, ...)

RCEPT = POWER, adjlim, v, f, nh, nphase, RS, (sp_1, ...)

1.	POWER	SR code for power line	ALPHA code
2.	adjlim	adjustment limit displacement from the initial spectrum level	dB
3.	v	voltage (RMS) of line	volts
4.	f	frequency (0 if DC)	Hz

5. nh   highest harmonic

6. nphase   number of phases

7. RS code   Ripple or noise spectrum code
                     (This overrides the SPEC parameter
                     on the EQPT card.)

    M461A   MIL-STD-461A

    M6181D   MIL-I-6181D

    M704A   MIL-STD-704A

    SPECT   user supplied ripple spectrum

8. Param-   Supply only if RS = SPECT, omit
   eters   for all others.
                    $(f_1, g_1, f_2, g_2, ..., f_n, g_n)$ where
                    $2 \le n \le 10$

where

    $f_1, f_2, ...$ user-supplied spectrum frequencies   Hz

    $g_1, g_2, ...$ user-supplied spectrum amplitudes   dBW/Hz

The required frequency range for power lines includes only the power frequency.

2.3.5.5.3 Signal and Control Lines -

SOURCE = SC, adjlim, f_ℓ, f_h, MODSIG, $(sp_1, sp_2, ...)$, a, UNIT, bw

RCEPT = SC, adjlim, f_ℓ, f_h, MODSIG, $(sp_1, sp_2, ...)$, a, UNIT, bw

IF MODSIG = VOICE or CVOICE, omit the subparameter group, for example:

    SOURCE = SC, adjlim, f_ℓ, f_h, CV, a, UNIT, bw

1. SC code   ALPHA code

    SIGNAL   signal line
    CNTROL   control line

2. adjlim   spectrum adjustment limit displace-   dB
                    ment from initial spectrum level

3. f_ℓ lowest required frequency   Hz

4. f_h highest required frequency   Hz

5. <u>MODSIG</u>   modulation/signal code   ALPHA code

<u>MODSIG</u>	<u>Description</u>	<u>Subparameters</u>
PDM	pulse duration	r_b
NRZPCM	nonreturn to zero pulse code modulation	r_b
BPPCM	biphase pulse code	r_b, em
PPM	pulse position modulation	r_b, t
TELEG	Morse telegrphy	wpm, ftone
PAM	pulse amplitude modulation	r_b, t
ESPIKE	exponential decay spike	r_b, t
RECTPL	rectangular	r_b, t
TPZD	trapezoidal pulse train	r_b, t, t_r
TRIANG	triangular	r_b, t
SAWTH	sawtooth	r_b, t
DMPSIN	damped sinusoid	r_b, f_r, f_I
VOICE	voice	—
CVOICE	clipped voice	—
SPECT	user supplied spectrum ($2 \le n \le 10$)	$f_1, g_1, \ldots, f_n, g_n$

where

t	pulse duration (10-90% of max. amplitude for ESPIKE)	sec
r_b	pulse repetition rate	Hz
t_r	rise time	sec
wpm	words per minute	
ftone	tone frequency (0 if no tone)	Hz
em	modulation index	none

f_r	oscillatory frequency of damped sinusoid	Hz
f_I	decay frequency of damped sinusoid	Hz
f_i	user supplied spectrum frequencies	Hz
g_i	user supplied spectrum levels (see UNIT)	
6. a	amplitude in units given by UNIT (0 if MODSIG = SPECT)	volts or amps
7. UNIT	unit code for a and g_i	ALPHA code
VLTS	Volts (dBμV/MHz if MODSIG = SPECT)	
AMPS	Amps (dBμA/MHz if MODSIG = SPECT)	
8. bw	bandwidth of information	Hz

2.3.5.5.4 Electro-explosive device –

$$RCEPT = \underline{EED},\ adjlim,\ P_{nf},\ i_{nf},\ (f_i,\ r_i,\ x_i,\ \ldots)$$

1. EED	Electro-explosive device	ALPHA code
2. adjlim	adjustment limit	
3. P_{nf}	maximum power for no fire	watts
4. i_{nf}	maximum current for no fire	amps

5. function

f_i = frequency (maximum of 10 frequencies)
r_i = real part of complex impedance at f_i
x_i = imaginary part of complex impedance at f_i

There is no required frequency range for EED's. The entire spectrum is adjustable by SGR. Also, a SOURCE card cannot be specified for an EED.

2.3.5.5.5 Equipment Case Leakage

$$SOURCE = \underline{CASE},\ adjlim,\ \underline{NBSPEC},\ \underline{BBSPEC}$$

$$RCEPT = \underline{CASE},\ adjlim,\ \underline{NBSPEC},\ \underline{BBSPEC}$$

1. CASE	code word denoting equipment case	ALPHA code

2. adjlim   spectrum adjustment limit displacement from initial spectrum level   dB

3. NBSPEC   narrowband specification spectrum   ALPHA code

    MILSPEC   SPEC given in EQPT card

    SPECT, $(f_1, g_1, f_2, g_2, \ldots f_n, g_n)$

        user supplied spectra

        f_i – frequency   Hz

        g_i – level   dBμV/meter at 1 meter

        $2 \leq n \leq 10$ from box

4. BBSPEC   broadband specification spectrum   ALPHA code

    MILSPEC   same as above

    SPECT, $(f_1, g_1, f_2, g_2, \ldots f_n, g_n)$

        same as above

        f_i – frequency   Hz

        g_i – level   dBμV/meter/MHz at 1 meter

        $2 \leq n \leq 10$ from box

There is no required frequency range for equipment cases. That is, the entire spectrum is adjustable by SGR.

2.3.6 Wire Bundle Data

These cards follow the subsystem data. Like the subsystem data, the cards must be in order of the bundle, point, segment, and wire hierarchy.

2.3.6.1 Bundle Card –

BUNDLE = ID

    ID – bundle ID   ALPHA ID

2.3.6.2 Bundle Points and Coordinates –

BPTS = $PT_1, x_1, y_1, z_1, PT_2, x_2, y_2, z_2, \ldots PT_n, x_n, y_n, z_n$

PT_i - ID of Point i

x_i - x coordinate of point in ground,   inches
butt line in aircraft or spacecraft

y_i - y coordinate of point in ground,   inches
waterline in aircraft or spacecraft

z_i - z coordinate of point in ground,   inches
fuselage station in aircraft or
spacecraft

$n \le 11$

Only one card with BPTS on it is permitted per bundle. Continuation cards (terminate continued card with comma) must be used if data will not fit on one card.

2.3.6.3 Bundle Segment -

$$BSEG = PTID_1, PTID_2 \quad \ell_1, h_1, compt._1, APID, \ldots$$

$PTID_1$	- point ID	ALPHA ID
$PTID_2$	- point ID	ALPHA ID
ℓ_1	- length of segment	inches
h_1	- average height above ground	inches
$compt._1$	- compartment ID through which segment runs (see EQPT card)	ALPHA ID
APID	- aperture ID if aperture exposed. If not exposed, 0. Must match ID on one APER card (Section 2.3.4.1)	ALPHA ID

Only one card with BESEG on it is permitted per bundle. Use continuation cards, as with the BPTS card, if data for all segments will not fit on one card. Only one compartment may be specified per segment. If a segment runs through more than one compartment, break into smaller segments.

2.3.6.4 Wire -

$$WIRE = WID, WTDID, PTID_1, PTID_2, PTID_3, \ldots$$

WID	wire ID (Referenced on PORT card)	ALPHA ID
WTDID	type ID in Wire Characteristics table. Must match an ID given on one WRTBL card at system level (Section 2.3.4.4)	ALPHA ID
$PTID_i$	Point ID	ALPHA ID

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2.3.7 Waiver Analysis Spectrum Shift Data

These are specified if, on the EXEC card, TASK = CEAR and CTASK = WAIVER. These cards specify portions of the emission, susceptibility, or both spectra which are to be shifted by the amount specified. The resulting interference is compared to that on the baseline run. The shifts are temporary and do not affect the permanent file data.

Any number of cards are allowed referencing the same port. This allows multiple shifts of a given spectrum. Overlapping ranges are allowed and are cumulative. (See Section 3.1.5)

If either the source or receptor spectrum displacement is not given, the omission must be shown by zero placeholders. The cards may be placed in any order, and up to 50 cards may be used in one run.

The format is:

$$WA = SID, EID, PID, fs_1, fs_2, ds, fr_1, fr_2, dr$$

where

SID	= subsystem ID	
EID	= equipment ID	
PID	= port ID	
fs_1	= low frequency of source shift range	Hz
fs_2	= high frequency of source shift range	Hz
ds	= displacement for source spectra	dB
fr_1	= low frequency of receptor shift range	Hz
fr_2	= high frequency of receptor shift range	Hz
dr	= displacement for receptor spectra	dB

2.3.8 End of Data

EODATA

This card indicates the end of all IDIPR input data.

2.3.9 TART Input Cards

As previously discussed, the input data for TART consists primarily of the work files generated by IDIPR. In addition to these work files, TART requires the user input card described below.

2.3.9.1 TART Control Card - Only TASK is required. The rest is optional

$$TART = TASK, AI, SP$$

1. TASK   Task code (required) must agree with
TASK and CTASK on IDIPR EXEC card as follows:

IDIPR TASK		IDIPR CTASK
SGR	SGR	–
TO	CEAR	TO
WAIVER	CEAR	WAIVER
SURVEY	CEAR	SURVEY

2. AI   Code for additional input card (optional)

AI	Additional input card follows TART card
NOAI	No additional input (default)

3. SP   Code for supplemental printout from transfer models

SP	Supplemental printout desired
NOSP	No supplemental printout desired (default)
DB	Debug output. Gives additional outputs for debugging.

2.3.9.2 Additional Input Card – This card is supplied if AI code = AI on
TART card. If used, it overrides the asm and empl parameters on the SYSTEM
card. It is a fixed field card, and both parameters must be right-justified
in their fields.

Columns	Parameter	Description
1-10	empl	EMI margin printout limit
11-20	asm	SGR adjustment safety margin

2.4 INPUT DATA RULES

The following rules apply to the IDIPR input data.

2.4.1 General Rules

1. All cards (except EODATA) must have a keyword, an optional ISF modify code, and an equals sign, followed by the parameters associated with the keyword. There are no column specifications. Parameters can be continued onto following cards by specifying the last non-blank character as a comma. Blanks are ignored and may be inserted between parameters for clarity, if desired. Parameters cannot have imbedded blanks.

2. Only those keywords specified in 2.3 are valid.

3. All parameters denoted as ALPHA CODES have a list of valid options to be selected by the user. Only these options will be recognized.

4. All keywords and alpha code words may be abbreviated by the first two letters or given in full (except for the REFWIRE codes on the PORT card).

5. Parameters and subparameter groups must be separated by commas.

6. The exact number of parameters associated with a keyword must be given except for control cards (EXEC, LIST, OUTPUT) and in those instances where alternate ways are given. If a parameter is not used or is inapplicable, a placeholder, such as 0, must be given to show the omission. This holds even when the parameter is the last one. The number of parameters given on each card is checked, and if the correct number is not given for the keyword, it is flagged as an error. On control cards, the position of a parameter must be preserved with placeholders; but if default options for parameters at the end are to be used, they may be omitted. For example, on an EXEC card, EXEC = ISP, NEW is sufficient. (The third parameter defaults to ISF.) If, however, CE (cancel error stop) is desired, the third parameter must be explicitly given to keep the position of CE; i.e., EXEC = ISP, NEW, ISF, CE.

7. Subparameters are enclosed in parentheses. There is either a variable or fixed number of these depending upon the particular use. If the number is fixed, the exact number must be given. For example, on the SOURCE = CNTRL card, MODSIG determines the subparameter specifications. If MODSIG is PDM, there is one and only one subparameter, r_b. If MODSIG is equal to SPECT, a variable number of subparameters is given (up to 10 frequencies and 10 amplitudes).

2.4.2 Alphanumeric ID's

All parameters denoted as ALPHA ID are user supplied alphanumeric identifications (ID). The following conventions apply to ID's:

1. An ID is composed of 1 to 5 alphabetic letters and digits. (More than 5 results in a syntax error.)

2. The first character of the ID must be alphabetic.

3. No special characters may be used in an ID.

4. In general, the ID should be unique for that keyword type. Some exceptions to this are permitted. For example, only port ID's within an equipment need to be unique, and each new equipment must have the first port ID specified as CASE.

2.4.3 Numeric Parameter Formats

All parameters not specified as ALPHA ID or ALPHA CODE are supplied as numeric values. The following conventions are used for numeric values:

1. Numbers with no fractional parts may be given with or without the decimal point. If omitted, the decimal is assumed to the right of the digits. For example, 243 is read as 243.0.

2. Floating point numbers may be expressed in exponential form, such as .nE+s, n.nE+s where n is the base and s is the exponent to the base 10. The plus sign may be omitted if s is positive (3.E1, 3E12, 31.4E-01, .314E+1 are all valid). If the decimal is omitted, it is assumed to be just before the "E". Thus, 3E12 is $3. \times 10^{12}$.

3. Double precision values are not allowed.

4. There is no complex value input except where specifically expressed. In such cases, the real and imaginary values are given as two parameters; for example, for a RCEPT = EED (electro-explosive device), the function is given as a complex number specified as 2 parameters; e.g., RC = EED, 30, 1, 1, (30, 1, 0, 1.E10, 1, 0).

2.4.4 Order of IDIPR Input Cards

The order of the input data is shown in Figure 7. The following rules apply:

1. The EXEC card can be preceded only by the TITLE and REMARK cards.

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EODATA

BUNDLE
DATA

WIRE =
BSEG =
BPTS =
BUNDLE =

UP TO
50/BNDLE

REPEAT
UP TO
10
TIMES

SUBSYSTEM
DATA

RCEPT =
SOURCE=
PORT=
FREQ =
EQPT =
SUBSYS=

REPEAT
UP TO
15/EQPT

REPEAT
UP TO
40
TIMES

SYSTEM
DATA
CARDS

IEFL =
OEFL =
EFQ =
WRTBL =
FILTER=
ANT =
APER =
WGTIP =
WNGRT =
FUSLGE=
SYSTEM =

ANY ORDER

IDIPR
CONTROL AND
IDENTIFICATION ARDS

REMARKS =
TITLE =
OUTPUT =
LIST =
EXEC =

ANY ORDER
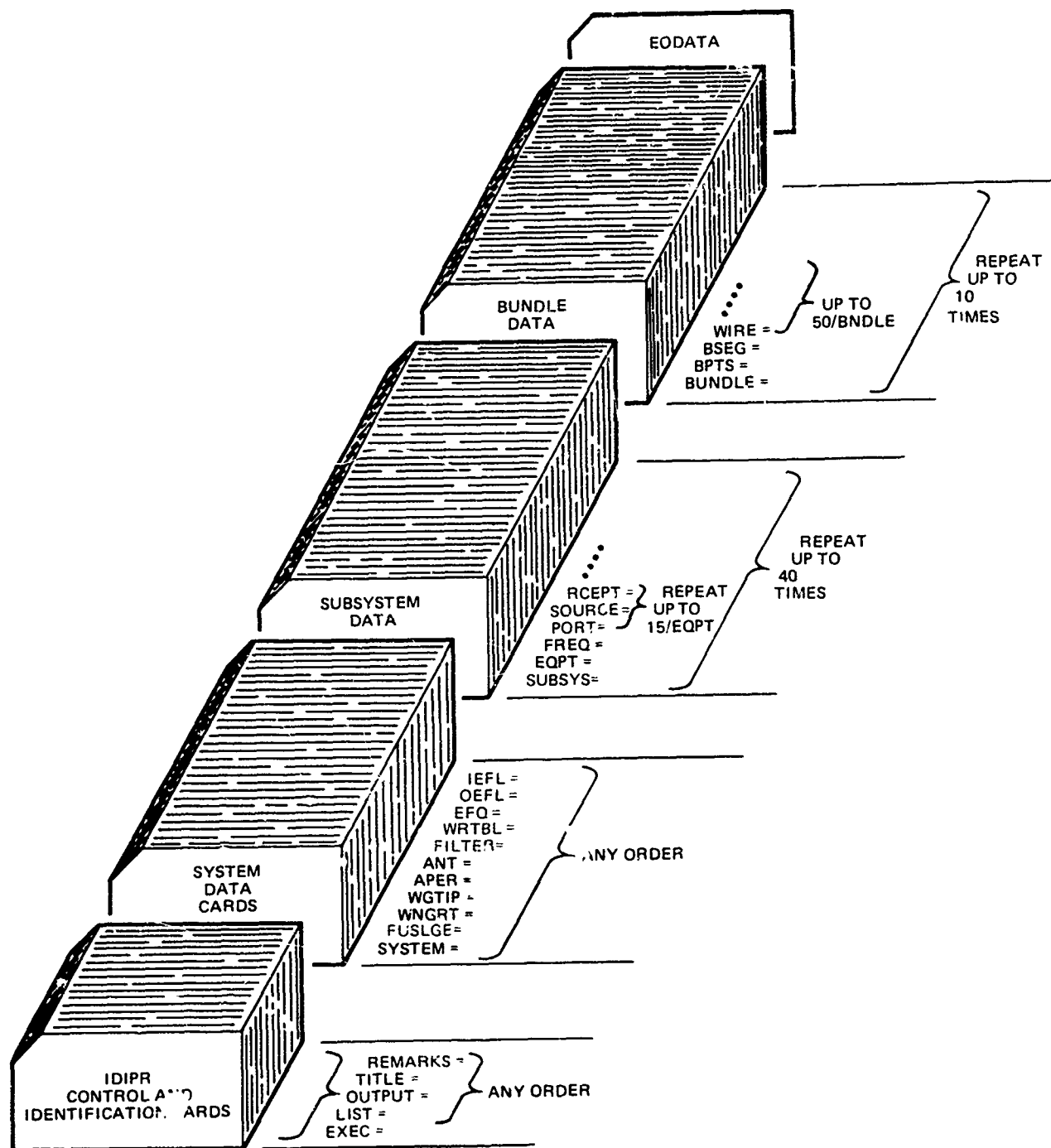
FIGURE 7
ORDER OF IDIPR DATA

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2. The execute and identification cards should be followed by the input/output control cards (LIST and OUTPUT). There is no specified order to these cards.

3. The data is divided into three groups, and these groups must be given in the following order:

    A. System data
    B. Subsystem data
    C. Bundle data

4. The data cards belonging to group (A), system data (SYSTEM, ANTENNA, FILTER, etc.), can be in any order.

5. In group (B), the data must be given in hierarchical order as follows:

    a. Subsystem
    b. Equipment
    c. Frequency
    d. Port
    e.,f. Source and/or receptor (either order)

    d-f cards repeat for a maximum of 15 ports; b-f repeat for a maximum of 40 equipments; a is inserted where applicable.

6. For new jobs (no old ISF), the first port of an equipment must be the equipment case. Its source or receptor cards must be given also.

7. At least one subsystem card must be given prior to the equipment data.

8. Port ID's must be unique within an equipment.

9. A subsystem must have at least one equipment.

10. In new jobs, an equipment must have at least one port other than the case. A port must have a SOURCE card or RCEPT card or both. It may not have multiple SOURCE or RCEPT cards.

11. In group (C), bundle data, the BUNDLE card containing the bundle identification must be the first card, followed by other bundle cards in any order.

12. Each bundle must have one and only one BSEG keyword card and one and only one BPTS keyword card. Continuation cards as needed should be used. A bundle must have at least one and up to 50 wire cards.

13. For multiple entry keywords, the maximum system specifications as given in Section 2.2 must not be exceeded.

14. The last card must be an EODATA card.

2.4.5 Modifying the ISF

Any ISF from a previous run can be used as input, and data cards can be used to modify any of the data on it. This ISF may have been created by an IDIPR run, an SGR run, or by the MERGE utility program (Appendix B).

To use an ISF with input modifications, JOBSTATUS on the EXEC card must be MOD. Three types of modifications can be made to the existing data on the ISF as indicated by the MODISF code. These are add (A), delete (D), and modify (M). These are specified by A, D, or M in parentheses following the keyword and before the equal sign on a data card. The rules governing the modify process are given below:

1. All data from the old ISF will be included unless overridden or deleted by an input card.

2. All rules given above for input data apply except where noted in this section.

3. All added subsystems must follow those to be modified or deleted.

4. Within a subsystem, all new equipments to be added must follow those equipments modified or deleted.

5. The data to modify subsystems and equipments must be given in the same order as they are on the ISF which is being modified. Hence, in setting up a modify run, the user must have a listing of the equipments on the ISF as this gives the order of equipments on the file.

6. Within an equipment, new ports and modifications to existing ports may be in any order.

7. A system data entry, such as an ANTENNA or FILTER, is deleted by giving the keyword, modify code, equals sign and identification. For example, ANT(D) = ABX2.

8. There is no order to the system data entries, including those which modify the ISF data.

9. Wire bundles to be modified must be in the same order as they appear on the ISF.

10. All bundles to be added must follow those which modify existing ISF bundles.

11. Since subsystem data and bundle data belong to the hierarchical system, modifications to an upper level also apply to the associated lower components. These are the components that have the upper level component ID as an implicit ID. Also, to modify a lower level, it is necessary to specify all upper level ID's that define it; that is, all its implicit ID's. For example, to delete port, XY2 of equipment TACAN of subsystem AC01, the following would be specified:

SU(M) = AC01
EQ(M) = TACAN
PO(D) = XY2

12. If a higher level keyword card has only a modification code, an equals sign, and an ID on it; the parameters of the keyword itself will not be modified. Instead, the ID will be used to give an implicit ID to a lower level keyword. If, however, parameters follow the ID, they will override those parameters of the keyword. If any parameters are specified on a modify card, all parameters must be re-specified.

13. Any higher level keyword, such as SUBSYSTEM, can be used to denote all equipments associated with it. For example, a sub-system with a DELETE (D) modification code and an ID would delete all equipments associated with it. If one equipment of a subsystem is to be deleted, the subsystem must have MODIFY (M) specified so as not to delete the other equipments. For example, to delete only TACAN, specify:

SU(M) = AC01
EQ(D) = TACAN

14. If not specified, the default modification status, is ADD.

2.4.6 Additional Rules for Trade-off Runs

The following rules apply to CEAR trade-off runs, in addition to the above rules for any modification to an ISF.

1. No ports may be deleted; hence, no equipments or subsystems may be deleted.

2. The frequencies at which the baseline spectra were generated may not be changed.

3. If changes are made to the common model parameter tables (antennas, filters, apertures, and wire characteristics), all ports that reference these tables must be "dummy" modified in order to be analyzed. Also, if bundle data is changed, ports referencing that bundle must be "dummy" modified. A dummy port modification is done by specifying a modify port card for identification but with the parameters unchanged from the baseline:

SU(M) = ID
EQ(M) = ID
PORT(M) = ID, p_1, p_2, . . .

where p_1, p_2, . . . are same parameters used in the baseline.

The source and receptor cards need not be given.

4. Any system data, other than the tables discussed in 3 above, cannot be changed.

2.4.7 CEAR Waiver Analysis Run

Up to a maximum of 50 waiver analysis cards may be given in any one run. Any number of spectrum shift cards referencing the same port are permitted. This allows multiple shifts on the same spectrum. Shifts are cumulative if the frequency ranges overlap. For example, two 10 dB shifts would result in a 20 dB shift where the ranges overlap.

Section 3

RUNNING IEMCAP

3.1 IEMCAP RUN OPTIONS AND CONTROL PARAMETERS

This section discusses the use of the data cards described in the previous section to run the program. Since IEMCAP is a diverse program with many task, subtask, and data options this section provides guidance in selecting the appropriate options for a given run.

3.1.1 Options on EXEC Card

The EXEC card controls the basic task and data input options to IDIPR. As discussed in Section 2.3.2.1, this card contains four parameters. The first, TASK, specifies the basic task or task routine. The options for this are ISP, SGR, and CEAR. ISP directs that input decode and initial processing are to be performed, but no working files are to be created. The other two options direct IDIPR to process the data and create working files for the designated TART analysis routine. SGR is used for specification generation, and CEAR for the other three analysis tasks.

The second parameter, JOBSTATUS, gives the job input status and has three options: NEW, OLD, and MOD. NEW indicates that input data is from cards only. That is, no ISF is used for input. This is used for an initial run. The OLD option indicates that input data is from an ISF created during a previous IDIPR or TART SGR run. The data on this file is to be used as is; that is, not modified by card input. If the data is to be modified, the MOD option is used.

The third parameter, CTASK, has a dual role. If TASK = CEAR, it specifies the subtask to be performed. These are TO for trade-off, WAIVER for specification waiver, and SURVEY for baseline EMC survey. If TASK = ISP and JOBSTATUS = OLD or MOD, CTASK indicates whether the input is an ISF or special user (SU) meaning a PIF. The PIF is identical to an ISF except it has no spectrum data. The SU option, therefore, indicates that the input file has no spectrum data. CTASK is normally not given if TASK = ISP and JOBSTATUS = NEW since this implies that no existing ISF exists. However, if the CERR option is used, CTASK must be specified as ISF as a placeholder. If TASK = SGR, CTASK is not given.

CERR, the fourth parameter, is optional and can only be used if TASK = ISP. If given, CERR can only be CE. Normally, IDIPR haults after reading and decoding the input cards if they contain errors. However, as each input card is read and decoded, the data is written on the PIF. But, if a card contains an error, for example the wrong number of parameters, the card is "deleted." That is, its data is not written on the PIF. Consequently, the PIF contains only "good" data. In some cases, it may be desirable to proceed into the initial processing section of IDIPR in spite of input errors so that further error analysis can be performed on the PIF data and to obtain a report. But, because some input data will have been

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dropped due to the errors, erroneous error messages and possibly unpredictable results may occur from using this option.

It is suggested that the CERR option not be used by one unfamiliar with IEMCAP especially during initial stages with new data which may contain numerous errors causing unpredictable results during initial processing.

If CERR is used, the three other parameters on the card must be specified as placeholders even though they could have been omitted and the default options used. For example,

        EXEC = ISP, NEW, ISF, CE.

If the CE option had not been specified, the card would have been

        EXEC = ISP, NEW

3.1.2 Input and Spectrum Processing (ISP) Runs

If the system to be analyzed is new and large, it may be desirable to run the data through IDIPR for error analysis and to obtain the initial spectra before beginning the time-consuming analysis task. The errors can be corrected, and the data re-run through IDIPR until all errors have been eliminated and the initial spectra are as desired. The number of runs of this type depends on the size and complexity of the data as well as the familiarity of the user with the IEMCAP input format. For this type of run, use of the ISP execution option causes all input decode, initial processing, and error analysis to be performed, but the eight working files are not created. This reduces the run and input/output time of IDIPR. Once the input is error free, or should be on the next run, TASK must be changed to the analysis task desired and CTASK supplied if needed before TART can be run.

There are two ways to handle the re-submission of the data if there are errors. The first and simplest is to fix the cards and re-run the job. However, for large systems with several boxes of data cards, it might be advantageous to use the PIF from the previous run as input to a modify run and correct the errors as updates to the PIF. The EXEC card for such a run would be

        EXEC = ISP, MOD, SU

See Section 2.4.5, Modifying the ISF, for rules in updating the file. Note that SU is used to indicate that the input file is a PIF.

As an alternative to using the CERR option, if a run had been made with a few or insignificant errors and the PIF was saved, it can later be used as input to initial processing for additional error analysis, for initial spectrum generation, and to obtain a report. The EXEC card for this is

        EXEC = ISP, OLD, SU

The advantage of this over using the CEIR option is that the user can examine the errors and determine their severity before proceeding into initial processing. Note that

    EXEC = ISP, NEW, SU

is not valid since there is no input file for NEW runs. If used this will give an error.

3.1.3 Specification Generation Runs

The user has several parameters at various levels in the data which provide control over the specifications generated by SGR. The two main control parameters are the adjustment safety margin (asm) and EMI margin printout limit (empl) located on the SYSTEM card (Section 2.3.3.1). (These can be overridden by use of the additional input card in TART.) If interference is found in a non-required portion of an emitter or receptor spectrum (i.e., the EMI margin is greater than asm), the emission or susceptibility level is adjusted so that the received signal is below the susceptibility by an amount equal to -asm. For example, if, at a given frequency, the EMI margin is 10 dB and asm is -6, the emission spectrum is reduced or the susceptibility is raised, depending on which was being adjusted, by 16 dB.

After emitter and receptor spectra have been adjusted, SGR determines any unresolved interference cases and prints a summary of each. It does this by computing the EMI margins for each coupled port pair using the adjusted spectra. If the maximum margin exceeds empl for a given port pair, the case is considered unresolved EMI and the summary is printed.

At the equipment level, the FIXADJ parameter on the EQPT card (Section 2.3.5.2) specifies whether or not its port spectra are adjustable. If an equipment exists and EMI specifications for it have been determined, FIXADJ is FIX meaning that all port spectra are not adjustable. For new equipments, this parameter should be ADJ so that SGR will adjust them.

At the port level, three parameters exist for use in controlling specification generation. On the PORT card (Section 2.3.5.4), sdfs and sdfr specify the displacement of the initial non-required spectra from the MIL-STD-461A or MIL-I-6181D levels. The first, sdfs, applies to source spectra; and sdfr, to receptor spectra. For example, if sdfs = 20 for an RF port, the non-required broadband and narrowband spectra will initially be set 20 dB higher than the MIL-STD-461A CE06 level. Parameter sdfs is algebraically added to the emitter spectrum, and sdfr is subtracted from the receptor spectrum.

On the SOURCE and RCEPT cards, adjlim sets the amount by which the initial spectra can be adjusted. This prevents extremely stringent specifications from being generated. For example, if adjlim is 30, the non-required portion of the spectrum can be adjusted 30 dB from the initial value. It must be a positive number.

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The EXEC card for running SGR is

    EXEC = SGR, NEW

or

    EXEC = SGR, OLD

depending on whether or not an old ISF exists.

3.1.4 Baseline EMC Survey Runs

This analysis surveys the baseline system for interference. The
control parameter is empl on the SYSTEM card. Emitter-receptor port pairs
with maximum EMI margin exceeding empl are printed in the output as
interference cases. The EXEC card for this analysis is

    EXEC = CEAR, NEW, SURVEY

The OLD option is valid if it is desired to survey an old system.

3.1.5 Waiver Analysis Runs

A waiver analysis must be an OLD run with an ISF used as baseline input
to IDIPR and a Baseline Transfer File (BTF) as baseline input to TART. The
ISF and BTF can be from either a previous SGR or SURVEY run. The requests
for waiver are specified as spectrum shift data on the WA card
(Section 2.3.7). This causes a temporary shift of the port spectrum by
the amount and in the frequency range specified. For example,

    WA = CNI, TACAN, POWER, 100, 500, 30, 1:0, 800, -20

causes the source broadband and narrowband emission from 100 to 500 Hz to
be increased 30 dB and the receptor susceptibility from 150 to 800 Hz to
be reduced by 20 dB. More than one shift per spectrum can be specified
by additional cards. The interference resulting from the shifted spectra
is compared to that in the baseline, and a summary is printed if the
maximum margin exceeds empl. The spectrum shifts are temporary and do
not affect the permanent files.

The EXEC card for a waiver analysis must be

    EXEC = CEAR, OLD, WAIVER.

3.1.6 Trade-off Analysis Runs

In a trade-off analysis, the interference in a system with modifications
is compared to the baseline system. The baseline system is defined by an
ISF input to IDIPR and a BTF input to TART. The modified system is defined
by modification card input to IDIPR as discussed in Section 2.4.5 on
modifying the ISF. Also, the rules for trade-off discussed in Section 2.4.6

must be observed. In particular, no ports may be deleted as this will cause alignment errors in TART between the working files and the BTF. New ports may be added, however. Also, an equipment frequency table cannot be changed since the analysis results stored on the BTF are at the baseline frequencies.

A trade-off run must always be a MOD run so that the EXEC card must be

    EXEC = CEAR, MOD, TO.

3.1.7 Additional IDIPR Options

The LIST and OUTPUT cards provide optional control over the IDIPR output. The LIST card allows the user to override the program defaults for listing reports of the old and new ISF's. A report gives a complete summary of all data on the ISF. Normally, IDIPR prints a report of the new ISF, containing the modifications if any. The old ISF report is normally not listed. If the user wishes a report of both old and new ISF's the following card is included:

    LIST = NEW, OLD

The primary purpose of the OUTPUT card is to suppress the creation of the new ISF. If this card is omitted, IDIPR generates an ISF with the updated data. However, for some ISP runs it might be desirable to not generate the new ISF. For example, this might be used for a new set of data in the error analysis stage where it is likely that initial processing will not be reached due to errors. This would particularly apply to small data sets for which correcting and re-submitting the cards is more expeditious than switching to a modify run. Another example is an ISP run made to obtain a report of an ISF only. To suppress creation of the new ISF, the card is

    OUTPUT = NOISF

The second and third parameters on the OUTPUT card are normally not used. The second parameter is for supplemental TART outputs. But, since this is overridden on the TART card, this parameter is used only as a placeholder when the third parameter is specified. The third parameter is used to obtain debug outputs from IDIPR. It causes control flags, data arrays, and program flow trace information to be printed. A program listing is necessary to identify these outputs. See the Computer Program Documentation for definitions of the flags and control variables.

3.1.8 Additional TART Options

TART has a basic input card, discussed in Section 2.3.9, which controls the task and run options. Generally, the task specified on this card must agree with the IDIPR execute card. The only exception involves the SGR and SURVEY tasks. Work files created by IDIPR under either option are identical and can be used interchangeably with TART for either task. TART will not execute if its task and the IDIPR task are incompatible.

The second input card, which is optional, allows the printout limit and SGR safety margin specified in the IDIPR input to be overridden. This feature allows TART to be rerun without having to rerun IDIPR. For example, assume SGR is run with a -12 dB adjustment safety margin and a large amount of unresolved interference results. A second SGR run may be made with a less stringent safety margin using the same working files without having to go through IDIPR. The supplemental printout is also specified

Examples of these cards are as follows. To run specification generation with a 10 dB printout limit, a -20 dB safety margin, and supplemental printouts, the two input cards to TART are

TART = SGR, AI, SP

and

10.   -20.

To run a trade-off analysis with no additional input card and no supplemental printout requires only one card:

TART = TO

To run a baseline survey with no additional input but with supplemental printout, the card is

TART = SURVEY, NOAI, SP

3.2 JOB SETUP

The previous sections described the input data, format, organization, and options for the various tasks performed by IEMCAP. This section discusses the setup of the cards and files running the program.

As previously discussed, the IDIPR and TART sections of IEMCAP are run as two separate executions. IDIPR generates a number of working files containing the processed data which are read by TART in performing the analysis task. IDIPR can be run alone, the working files saved, and TART run at a later time. This might be advantageous for large, new data sets in detecting and correcting data errors. It also allows the user to look at the data and initial spectra before running TART. Alternatively, IDIPR and TART can be run consecutively as one job. This might be used for small data sets or a small number of modifications to an existing ISF.

Control cards for the particular computer must be supplied to execute the two program sections, provide and save the appropriate files, and define the input, output, and file logical units. In general, these will consist of the following types of cards:

o Identification and accounting cards

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o   Select card to fetch program from library

o   Data definition cards

o   Initiate execution card

o   Error condition directives

o   Core request card

o   Delimiters

Check the computer system manuals for the specific cards.

The input card deck will consist of

o   Computer control cards, as discussed above

o   IEMCAP program deck if not stored on permanent library file in
    the computer

o   IEMCAP input arranged as discussed in Section 2.4.4.

Basic setups for the five tasks are illustrated graphically in
Figures 8 through 12. The first of these (Figure 8) is an ISP run. The
temporary PIF (CARDIN) and, optionally, the new ISF are created, and a
report of the data is printed. Figures 9 through 12 show specification
generation, waiver analysis, trade-off, and survey runs. The figures show
the two steps as separate jobs, but as discussed above, they may be run
separately or together. (In Figure 12, the IDIPR step is assumed.) During
the Step 1 (IDIPR) the seven work files and the new ISF are generated and
the report of the data is printed. In Step 2 (TART) reads these files. The
Baseline Transfer File (BTF) is generated for specification generation and
survey runs and read as input for waiver and trade-off runs. During
specification generation an updated ISF is also generated containing the
adjusted port spectra, and four scratch files are used which are released
after the run. In all cases, printed reports are generated from both IDIPR
and TART of the data parameters and the analysis results.

3.3 RESTART CAPABILITY

IEMCAP saves analysis results at several stages of execution and
provides file updating capability to use these on subsequent runs to avoid
reprocessing data. During Input Decode, error-free data is written to the
Processed Input File. If errors occur during decoding, IDIPR halts after
printing all errors and offending cards. The user can use the PIF as he
does an old ISF file and update it with corrected data on the following run.
An option also allows the user to proceed into Initial Processing even
though errors occurred. Spectra will be generated for those ports for which
the data was found error-free. The results of Initial Processing, which
performs file updates and generates initial spectra for new and modified
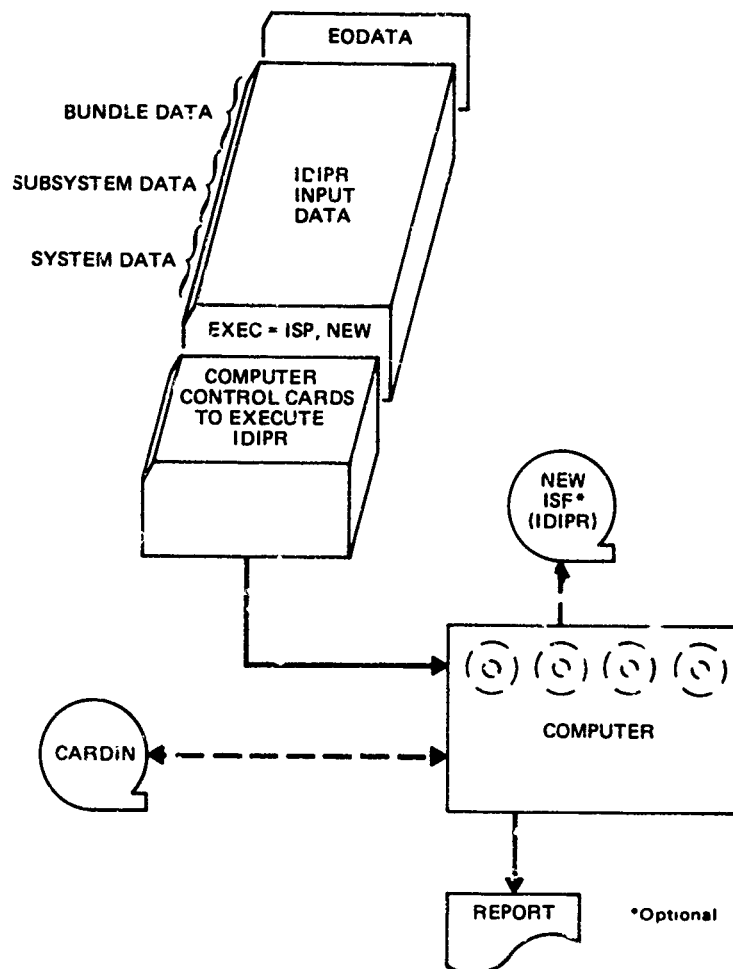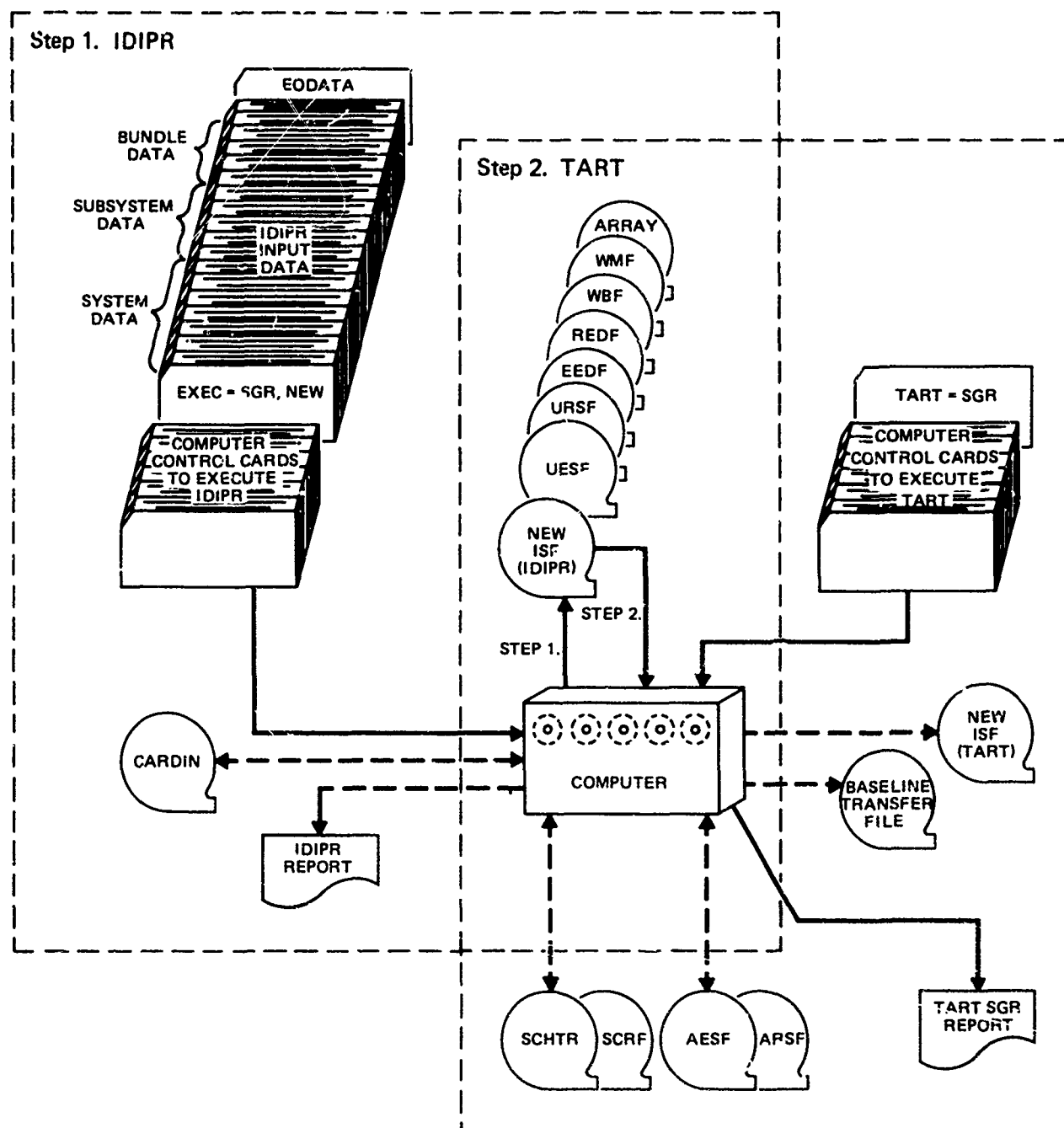
FIGURE 8
INPUT AND SPECTRUM PROCESSING
(ISP) RUN

FIGURE 9
SPECIFICATION GENERATION RUN (NEW SYSTEM)

Step 1. IDIPR

EODATA

WAIVER
ANALYSIS
DATA

IDIPR
INPUT
DATA

EXEC = CEAR,
OLD, WA

CONTROL CARDS
TO EXECUTE
IDIPR

Step 2. TART

ARRAY

WMF

WBF

REDF

EEDF

URSF

UESF

NEW
ISF
(IDIPR)

STEP 1.

STEP 2.

TART = WA

CONTROL CARDS
TO EXECUTE
TART

OLD ISF
(GENERATED
ON PREVIOUS
TART RUN)

CARDIN

COMPUTER

BASELINE
TRANSFER
FILE

(GENERATED ON
PREVIOUS TART
RUN OR
SGR OR
SURVEY RUN)

IDIPR
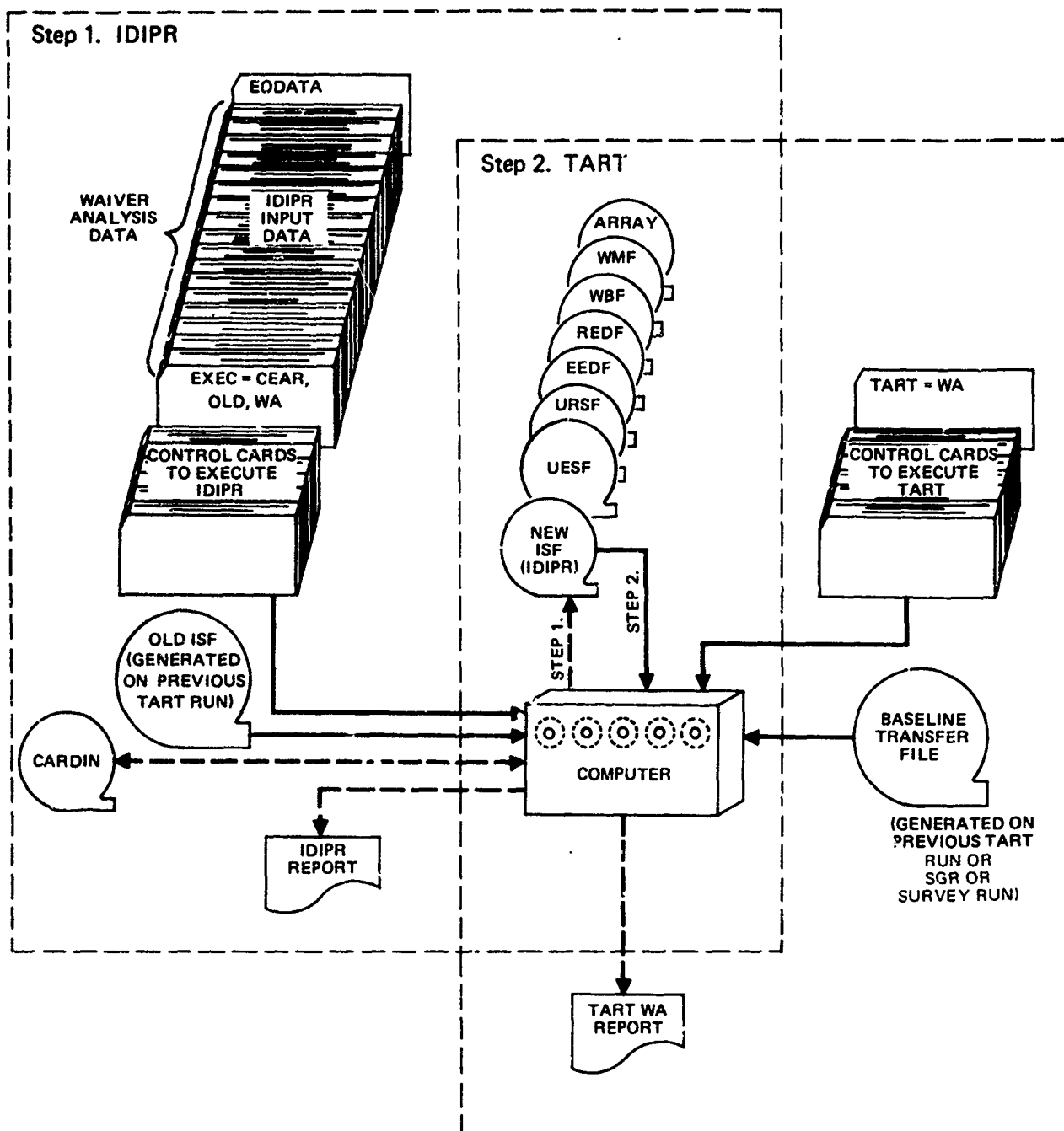REPORT

TART WA
REPORT

FIGURE 10
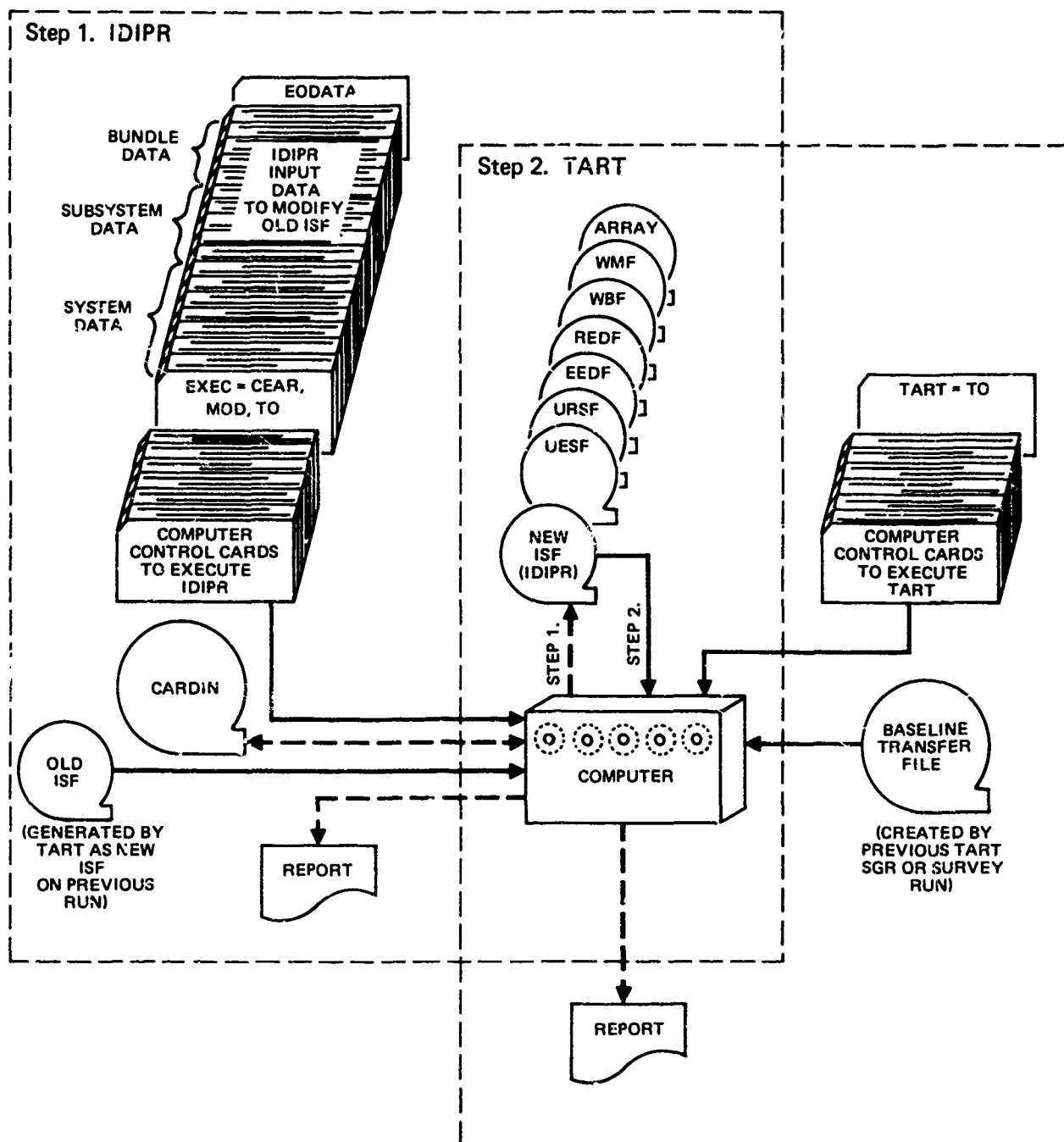WAIVER ANALYSIS RUN

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FIGURE 11
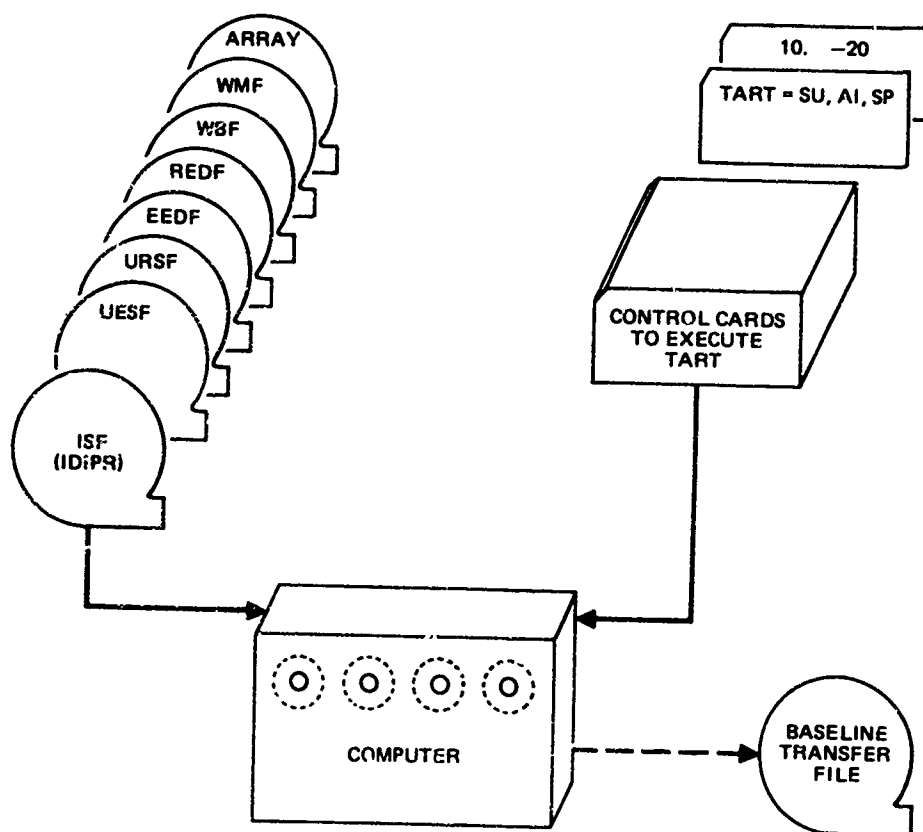**TRADE-OFF RUN**

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FIGURE 12
SURVEY RUN

ports, are saved on the ISF. This file can be updated as many times as are needed until the user is satisfied with the result. If the SGR/CEAR option has been selected and provisions made to save the work files, the user is ready to run TART whenever IDIPR executes without error.

Section 4

PRINTED OUTPUTS

During execution, a number of printed outputs are generated by IEMCAP. This section describes these outputs and gives examples. The examples are from a test case called the "mini-system" which is presented in detail in Section 5, Example Test Case.

4.1 IDIPR PRINTED OUTPUTS

4.1.1 Error Messages

During input decode, if errors are found in the data, an appropriate error message is printed with the data card. Additional error messages are printed during initial processing if errors are encountered during file updating or in generating initial spectra. Examples of the input decode error messages are shown in Figure 13. Note that some errors can precipitate additional errors. For example, if an error occurs on a PORT card, it is deleted; i.e., it is presumed not to exist in the input data. The SOURCE and RCEPT cards following the deleted card will therefore have no heirarchy data, and messages to that effect will be generated. The error codes are discussed in Section 4.3.

4.1.2 Input Data Card Listing

After all cards have been read, decoded, and checked for errors, a listing of these cards is printed. An example of such a listing is given in Section 5.

4.1.3 Intrasystem Signature File Report

During initial processing, a report of all the data that comprises the system for which the analysis task is to be performed is printed. As this data is also saved on the ISF generated by IDIPR, this report gives a listing of the data on the new ISF. During initial processing, a report of the old ISF used as input to IDIPR may optionally be printed. The ISF report consists of a summary of the system data and the equipment data, followed by each equipment's frequency table and initial spectra of each port in the equipment and, lastly, the bundle data. The spectrum printout for each port in the system consists of the initial broadband and narrowband emission spectra and receptor susceptibility levels dependent on their specification as a source and/or receptor. These levels are obtained from spectrum model synthesis from the input data and quantized to the equipment table frequencies. If an old ISF is used that was generated by a TART SGR run, for ports with no changes to the input data, the adjusted spectra are printed. Initial spectra are computed and printed only for new or modified ports. (In the spectra, -1000 dB indicates no emission and +1000 dB indicates no response.) All spectrum levels printed by both IDIPR and TART are in the units shown in Table 4. Example report outputs are given in Section 5.

```
***CARD NO.        4
FU=1,2,3,4,5,FAAT

***ERROR NO.       3

*****NO MATCH FOR ALPHA CODE
***THIS CARD WILL BE DELETED***

***CARD NO.        7
ANT=COMTA,DI,HZ(0.2)

***ERROR NO.       3

*****NO MATCH FOR ALPHA CODE
***THIS CARD WILL BE DELETED***

SOURCE=SIGNAL,3..,20.E3,4.E6,RECTPL(20.E3,1.E-6),10,VLTS,4.E6
---------------$
***CARD NO.       22
SOURCE=SIGNAL,3..,20.E3,4.E6,RECTPL(20.E3,1.E-6),10,VLTS,4.E6

***ERROR NO.       5

*****ILLEGAL SYNTAX
***THIS CARD WILL BE DELETED***

***CARD NO.       24
RC(M)=RF,30,1E6,4E6,1E-9,3E6,SPECT(-.5E6,-18.2,0,71.8,.5E6,-18.2),0

***ERROR NO.      16

*****WRONG MOD. CODE FOR JOB TYPE
***THIS CARD WILL BE DELETED***

***CARD NO.       25
PORT=AIDOT,WIRE,(BNOL2,B2W2,A2,GND,GND,NOTEX),55,0,0,0

***ERROR NO.       4

*****NO. PARAMETERS INCORRECT
***THIS CARD WILL BE DELETED***

SOURCE=SIGNAL,3..,20.E3,4.E6,RECTPL(20.E3,1.E-6),10,VLTS,4.E5
---------------$
***CARD NO.       26
SOURCE=SIGNAL,3..,20.E3,4.E6,RECTPL(20.E3,1.E-5),10,VLTS,4.E5

***ERROR NO.       5

*****ILLEGAL SYNTAX
***THIS CARD WILL BE DELETED***


***ERROR NO.      25

*****MISSING SO/RC FOR PORT
PORT AIDOT OF EQPT. UHFCO WILL BE DELETED.

***ERROR NO.      26
```

FIGURE 13
EXAMPLE IDIPR ERROR DIAGNOSTIC OUTPUTS

4.1.4 Debug Printout

An option is available to print debug information that, if used in conjunction with a source listing, provides internal flags and messages to aid in debugging.

4.2 TART PRINTED OUTPUTS

The TART outputs are summaries of EMI margins between emitter-receptor port pairs and to the total received signal from all emitters into each receptor. These margins are printed for each frequency, and the integrated margin is also printed. For specification generation runs, summaries of emitter and receptor spectrum adjustments are printed. Optionally, the user may request supplemental printouts which provide detailed transfer model outputs. These outputs are described below in relation to the four TART analysis tasks.

4.2.1 Specification Generation Outputs

Outputs are provided for the three SGR phases: emitter spectrum adjustment, receptor adjustment, and unresolved EMI. After these, the finally adjusted spectra are summarized for each port.

4.2.1.1 Adjusted Emitter Spectra Summary - An example summary of the adjusted emitter broadband and narrowband spectra is shown in Figure 14. In this, as well as all other emitter-receptor pair summaries, entries are listed by ascending frequency from both the emitter and receptor frequency tables. Hence, the first column gives the frequency, and the second gives the base (i.e., EMTR or RCPT frequency table) from which that frequency was taken. In the third column, the letters "REQD" are printed if the table frequency interval contains the emitter's required frequency range. The transfer ratio in dB, which is printed next, includes all transfer from the emitter port generator to the receptor port load, including filters, antenna gains, propagation loss, inter-wire coupling, etc.

The next series of output columns give narrowband and broadband emitter spectrum and EMI margin data after adjustment in conjunction with the receptor. The EMI margin and received signal level are printed at both emitter and receptor frequencies. However, the adjusted emitter spectrum level, the amount of spectrum adjustment, the relation to the present spectrum level and the adjustment limit are printed at emitter frequencies only. In addition, the bandwidth factor in dB is printed for broadband. Narrowband and/or broadband outputs at a given frequency are not printed where the EMI margin is below -900 dB. This is true for all port pair margin summaries printed by TART.

The received signals at the receptor frequencies are computed by interpolation between the emitter frequencies on either side. Hence, if one of these emitter points is -1000 dB (indicating no emission), the interpolated signal will be between -1000 and the non-zero emitter point. An example of

ADJUSTED EMITTER SPECTRA

EMTR -- SUBS = CNI   EQPT 5 = TACAN   PORT 2 = TACRF

RCPT ---- SUBS = TMGPO   EQPT 6 = OBPYL   PORT 4 = OBOP

PATH = ANT TO ANT

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	ADJSTD EMI MGN	RCVD SIGNAL	NARROWBAND ADJ EMTR SPCT LEV	ADJMT AMOUNT	SPCT LEV TO LIMIT	ADJSTD EMI MGN	RCVD SIGNAL	BROADBAND ADJ EMTR SPCT LEV	ADJMT AMOUNT	SPCT LEV TO LIMIT	BDWTH FCTR
1.13689E+04	EMTR	0.0	-94.0	6.0	6.0	0.0	30.0	-98.4	1.6	26.0	0.0	30.0	-24.4
2.03502E+04	RCPT	0.0	-94.0	6.0				-96.1	3.9				-22.1
2.53933E+04	EMTR	0.0	-94.0	6.0	5.0	0.0	30.0	-95.2	4.8	26.0	0.0	30.0	-21.2
3.90795E+04	RCPT	0.0	-94.0	6.0				-93.3	6.7				-19.3
5.24919E+04	EMTR	0.0	-94.0	6.0	6.0	0.0	30.6	-96.7	3.3	26.0	0.0	30.0	-22.7
7.50093E+04	RCPT	0.0	-94.0	6.0				-95.2	4.8				-21.2
1.13095E+05	EMTR	0.0	-94.0	6.0	6.0	0.0	30.6	-93.4	6.5	25.0	0.0	30.0	-19.5
1.43973E+05	RCPT	0.0	-94.0	6.0				-92.4	7.6				-19.4
2.39064E+05	EMTR	0.0	-94.0	6.0	5.0	0.0	36.0	-90.2	9.8	26.0	0.0	30.0	-16.2
2.76342E+05	RCPT	0.0	-86.1	3.9				-95.4	4.6				-15.6
5.05463E+05	EMTR	0.0	-36.1	-5.2	-5.2	-11.2	19.8	-28.1	.8	-4.0	-30.0		4.8
5.30413E+05	RCPT	0.0	-28.4	-5.2				-22.4	.8				4.8
1.00003E+06	RCPT	0.0	-10.4	-5.2				-4.4	.8				4.8
1.01809E+06	EMTR	0.0	-10.4	-5.2	-5.2	-11.2	18.8	-4.4	.8	-4.0	-30.0		4.9
1.06845E+06	RCPT	0.0	-15.3	-10.1				-4.4	.8				4.9
1.95410E+06	RCPT	0.0	-16.5	-11.3	-11.3	-17.3	12.7	-4.4	.8	-4.0	-36.0		4.8
2.25877E+06	EMTR	0.0	-9.9	-4.7				-4.4	.8				4.8
3.75070E+06	RCPT	0.0	-9.0	-3.8				-4.4	.8				4.8
4.00009E+06	RCPT	0.0	-43.7	-1.5	-1.5	-7.5	22.5	-41.4	.8	-4.0	-30.0		4.8
4.77517E+06	EMTR	0.0	-52.8	-1.0				-49.2	2.6				4.8
5.08000E+06	RCPT	0.0	-97.4	2.6				-90.5	9.5				-3.0
7.19910E+06	EMTR	-2.3	-96.2	2.8	6.0	0.0	30.0	-79.2	26.4	26.0	0.0	30.0	-1.6
1.08058E+07	RCPT	-5.5	-99.5	.5				-81.1	18.0				.3
1.38162E+07	RCPT	-11.3	-105.3	-5.3	5.0	0.0	30.0	-85.0	15.0	26.0	0.0	30.0	1.2
2.13414E+07	EMTR	-14.2	-108.2	-8.2				-87.0	13.0				3.5
2.65223E+07	RCPT	-21.3	-115.3	-15.3	5.0	0.0	30.0	-91.7	8.3	26.0	0.0	30.0	4.1
3.71169E+07	EMTR	-22.9	-116.9	-16.9				-92.8	7.2				6.3
5.09069E+07	RCPT	-31.4	-125.4	-25.4	5.0	0.0	30.0	-98.6	1.4	26.0	0.0	30.0	6.9
9.53796E+07	EMTR	-31.7	-125.7	-25.7				-98.8	1.2				6.7
0.77103E+07	RCPT	-40.6	-134.6	-34.5				-107.9	-7.9				7.0
1.75547E+08	EMTR	-41.6	-135.6	-35.6	6.0	0.0	30.0	-108.6	-8.6	26.0	0.0	30.0	9.5
2.01439E+08	RCPT	-48.7	-143.7	-43.7				-114.2	-14.2				10.3
3.59974E+08	EMTR	-52.1	-146.1	-46.1	5.0	0.0	30.0	-115.6	-15.6	26.0	0.0	30.0	12.4
4.26274E+08	RCPT	-59.0	-153.0	-53.0				-120.6	-20.6				
6.09942E+08	RCPT	-61.1	-155.1	-55.1	5.0	0.0	30.0	-122.1	-22.1	26.0	0.0	30.0	13.0
8.06600E+08	EMTR	-62.9	-156.9	-56.9	6.0	0.0	30.0	-123.3	-23.3	26.0	0.0	32.0	13.5
9.01163E+08	EMTR	-63.8	-157.8	-57.8	6.0	0.0	30.0	-124.0	-24.0	26.0	0.0	30.0	13.8
9.42000E+09	EMTR REQD	-64.5	-30.0	70.0	134.8	0.0	30.0	-71.3	28.7	97.5	0.0	30.0	-4.0
1.02530E+09	EMTR REQD	-64.2	-31.4	68.6	134.8	0.0	30.0	-72.7	27.3	97.5	0.0	30.0	-4.0
1.13000E+09	EMTR	-57.3	-161.3	-61.3	6.0	0.0	30.0						
1.29000E+09	EMTR	-6.1	-162.1	-62.1	6.0	0.0	30.0						

FIGURE 14

SAMPLE OUTPUT - SGR ADJUSTED EMITTER SPECTRA

ADJUSTED EMITTER SPECTRA

EMTR -- SUBS = CNI   EQPT 5 = TACAN   PORT 2 = TACRF

RCPT -- SUBS = IMGPD EQPT 6 = ORPVL   PORT 4 = ORPR

PATH = ANT TO ANT

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	ADJSTD EMI MGN	RCVD SIGNAL	NARROWBAND ADJ EMTR SPCT LEV	ADJMT AMOUNT	SPCT LEV TO LIMIT
1.32620E+09	RCPT RFQD	-68.6	-162.6	-62.5			
1.330C0E+09	EMTR	-69.2	-163.2	-63.2	6.0	0.0	30.0
1.94512E+09	EMTR	-74.1	-99.3	.7	74.8	0.0	30.0
2.54551E+09	RCPT	-78.6	-111.6	-11.6			
4.02753E+09	EMTR	-85.0	-131.2	-31.2	54.8	0.0	36.0
4.36585E+09	RCPT	-89.1	-146.9	-46.9			
8.51443E+09	EMTR	-98.7	-192.6	-92.6	6.0	0.0	30.0
9.37792E+09	RCPT	-100.4	-194.3	-94.3			
1.40003E+10	RCPT	-112.6	-206.5	-106.5			

(CONTD)

ADJSTD EMI MGN	RCVD SIGNAL	BROADBAND ADJ EMTR SPCT LEV	ADJMT AMOUNT	SPCT LEV TO LIMIT	BDWTH FCTR
-123.9	-23.8	37.5	0.0	30.0	12.0
-134.8	-34.9				14.1
-152.4	-52.1	17.5	0.0	30.0	16.1
-217.3	-317.3				16.9

PORT PAIR INTEGRATED EMI MARGIN = -.9

FIGURE 14 (Continued)
SAMPLE OUTPUT - ADJUSTED EMITTER SPECTRA

such a case is in Figure 14 at 4.88585 GHz where the broadband received
signal is -317.3 dB μA/MHz caused by interpolation between 17.5 dB at
4.02753 GHz and -1000.0 dB at 8.514435 GHz (not printed). Such points
should be ignored.

4.2.1.2 Receptor Spectrum Adjustment Summary - After each emitter has been
adjusted in conjunction with each receptor, the receptors are adjusted.
This receptor adjustment is made in conjunction with the total received
signal from all emitters coupled to the given receptor. SGR prints a
summary of this, as illustrated in Figure 15. The frequency is printed
first, followed by "REQD" if the frequency is within the receptor's required
frequency range. Next, the adjusted EMI margin to the total signal, the
total signal level, and the adjusted receptor spectrum susceptibility level
are printed. The amount of adjustment and the relation to the adjustment
limit of the receptor spectrum are also printed.

4.2.1.3 Unresolved Interference Summary - After a given receptor port has
been adjusted, SGR scans through the emitters coupled to it and computes
the margins. If the maximum margin exceeds empl on the SYSTEM card (or
TART additional input card) a summary is printed, as illustrated in
Figure 16.

     The outputs in this summary are similar to those described in
Section 4.2.1.1 without the adjustment data. The frequency, frequency base,
and transfer ratio are printed as before. The receptor spectrum level at
the receptor frequencies and the interpolated values at the emitter
frequencies (identified by an "I") are printed. If the table frequency
interval is within the receptor frequency range, an "R" is printed also.
At each receptor frequency, the relation of the receptor spectrum level to
the adjustment limit is printed next.

     Following the receptor outputs, the EMI margin, the emitter spectrum
level, the relation of the spectrum level to the adjustment limit, and the
received signal level are printed for the narrowband and broadband emitter
spectra. The interpolated emitter spectrum values are identified by an
"I," and the required emitter spectrum points are identified by an "R" next
to the spectrum level. The bandwidth factor, in dB, is also printed.

4.2.1.4 Finally Adjusted Port Spectra - After all of the spectra have been
adjusted and all unresolved interference has been determined and printed,
the spectra for each port are printed. The format is identical to that of
the IDIPR initial port spectrum outputs.

4.2.2 Baseline System EMC Survey Outputs

     For each case with maximum EMI margin exceeding empl, CEAR prints a
summary, as shown in Figure 17. The format is identical to that of the SGR
Unresolved Interference EMI Summary except that the relation of the emitter
and receptor spectra to their adjustment limits are not printed since there
are no adjustments in this analysis. The discussion in Section 4.2.1.1 for
the SGR output regarding erroneous values due to interpolation with one
spectrum point at -1000 dB also applies here.

SUBS = CNI   EQPT   6 = IFF   PORT   2 = IFFRF

FREQUENCY — (HERTZ)	ADJUSTD EMI MGN	RCVD SIGNAL	ADJUSTED SPECTRUM	ADJMT AMOUNT	SPCT LEV TO LIMIT
9.83032E+03	-56.3	46.7	103.0	0.0	30.0
1.66071E+04	-56.3	46.7	103.0	0.0	30.0
3.12328E+04	-56.3	46.7	103.0	0.0	30.0
5.87392E+04	-56.3	46.7	103.0	0.0	30.0
1.10470E+05	-56.3	46.7	103.0	0.0	30.0
2.07760E+05	-56.4	46.7	103.0	0.0	30.0
3.90733E+05	-6.0	97.2	103.2	.2	29.8
7.34847E+05	12.1	145.1	133.0	30.0	0.0
1.38202E+06	12.2	145.2	133.0	30.0	0.0
2.59915E+06	12.1	145.1	133.0	30.0	0.0
4.88420E+06	11.1	144.1	133.0	30.0	0.0
9.19318E+06	-30.0	73.0	103.0	0.0	30.0
1.72895E+07	-47.2	55.8	103.0	0.0	30.0
3.25162E+07	-65.1	37.9	103.0	0.0	30.0
6.11530E+07	-72.8	30.2	103.0	0.0	30.0
1.15010E+08	-81.2	21.8	103.0	0.0	30.0
2.16290E+08	-43.2	59.8	103.0	0.0	30.0
4.06789E+08	-50.7	52.3	103.0	0.0	30.0
7.65044E+08	-63.8	34.2	103.0	0.0	30.0
1.03003E+09	RFOB 31.8	54.8	23.0	0.0	30.0
1.09000E+09	-48.8	54.2	103.0	0.0	30.0
1.43981E+09	-113.3	-10.3	103.0	0.0	30.0
2.70536E+09	-125.3	-22.3	103.0	0.0	30.0
5.08907E+09	-77.5	25.5	103.0	0.0	30.0
9.57096E+09	-144.3	-41.3	103.0	0.0	30.0
1.40030E+10	-156.3	-53.3	103.0	0.0	30.0

FIGURE 15
SAMPLE OUTPUT - SGR RECEPTOR SPECTRUM ADJUSTMENT

NOTE: The program also prints out "BASELINE
        SYSTEM INTERFERENCE FROM TOTAL SIGNAL"
        which includes a TOTAL INTEGRATED EMI
        MARGIN. The printout is identical to that
        shown in Figure 18.

U N R E S O L V E D   I N T E R F E R E N C E

EMTR -- SUBS = CNT   EQPT   1 = UHFCO   PORT   2 = COMLO

RCPT -- SUBS = GND   EQPT   6 = IFF   PORT   2 = IFFRF

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SPCT LEV	RCPT LEV TO LIMIT	EMI MARGIN	EMITTER SPEC LEV	EMTR LEV TO LIMIT	RCVR SIGNAL	EMT MARGIN	EMITTER SPEC LEV	EMTR LEV TO LIMIT	RCVD SIGNAL	BDWTH FCTR
						NARROWBAND				BROADBAND			
1.53640E+04	EMTR	-8.0	103.0 I		-69.5	43.0	30.0	35.0					
1.64071E+04	RCPT	-8.0	103.0	30.0	-68.0	43.0 I	36.0	35.0					
3.02200E+04	EMTR	-8.1	103.0 I		-68.1	43.0		34.9					
5.12320E+04	RCPT	-8.1	103.0	30.0	-68.1	43.0 I		34.9					
5.87392E+04	RCPT	-8.2	103.0	30.0	-68.2	43.0 I		34.8					
6.14400E+04	EMTR	-8.4	103.0 I		-68.2	43.0	30.0	34.6					
1.19470E+05	RCPT	-8.4	103.0	30.0	-68.4	43.0 I		34.6					
2.02800E+05	EMTR	-8.4	103.0 I		-68.4	43.0	30.0	34.6					
2.02700E+05	RCPT	-8.7	103.0	30.0	-68.7	43.0 I		34.5					
2.45740E+05	EMTR	-8.7	103.1 I		-68.8	43.0	30.0	34.3					
3.90733E+05	RCPT	-9.0	103.2	29.8	-79.6	32.7 I	14.5	23.7					
7.34647E+05	EMTR	-9.2	114.1 I		-95.7	27.6		18.4					
4.01520E+05	RCPT	-9.5	133.0	0.0	-123.4	19.1 I	0.0	3.2					
9.43043E+05	EMTR	-9.8	133.0 I		-129.6	13.0		2.9					
1.38325E+06	RCPT	-10.2	133.0	0.0	-130.2	13.0 I	0.0	2.4					
1.96603E+06	EMTR	-10.6	133.0 I		-130.6	13.0		2.4					
2.59912E+06	RCPT	-11.0	133.0	0.0	-131.6	13.0 I	0.0	2.0					
3.93216E+06	EMTR	-11.8	133.0 I		-131.8	13.0		1.2					
4.84420E+06	RCPT	-12.3	133.3	0.0	-132.3	13.3 I	0.0	.8					
7.86432E+06	EMTR	-15.1	110.4 I		-112.5	13.0		-2.0					
9.10310E+06	RCPT	-16.9	103.0	30.0	-100.1	19.4 I	0.0	-2.0					
1.57286E+07	EMTR	-23.3	103.0 I		-87.3	43.0	30.0	19.7					
1.72895E+07	RCPT	-24.5	103.0	30.0	-84.5	43.0 I		18.5					
3.14573E+07	EMTR	-32.5	103.0 I		-92.5	43.0	30.0	10.5					
3.25162E+07	RCPT	-32.9	103.0	30.0	-92.9	43.0 I		10.1					
6.11530E+07	RCPT	-42.3	103.0	30.0	-102.3	43.0 I		.7					
6.29445E+07	EMTR	-42.7	103.0 I		-102.7	43.0	36.0	.3					
1.15010E+08	RCPT	-52.8	103.0	36.0	-112.8	43.0 I		-9.8					
1.25829E+08	EMTR	-54.4	103.0 I		-114.4	43.0	30.0	-11.4					
2.16298E+08	RCPT	-64.6	103.0	30.0	-62.1	105.5 IR		40.9	-292.9	-112.2 IR		-189.9	-13.0
2.51654E+08	EMTR	-67.7	103.8 I		-47.7	123.0 R	30.0	65.3	-47.9	137.9 R	30.0	55.2	-13.0
4.06799E+08	RCPT	-73.1	103.0	30.0	-54.1	123.0 IR		44.7	-58.3	135.9 IR		44.8	-13.0
5.03165E+08	EMTR	-83.0	103.0 I		-63.6	123.0 R	30.0	40.0	-63.2	135.9 R	30.0	39.8	-13.0
7.65044E+08	RCPT	-94.0	103.0	30.0	-104.2	92.8 I		-1.2	-78.5	105.7 J		24.6	12.8
1.80663E+09	EMTR	-101.8	29.2 IR		-58.0	73.0	30.0	-28.8	-36.7	85.9 I		-7.5	8.5
1.93060E+09	RCPT	-102.5	23.0 R		-53.5	72.0 I		-30.5	-67.1	43.9 I		-44.1	8.5
1.04900E+09	RCPT	-104.2	103.0	30.0	-137.7	69.6 I		-34.6	-235.6	-38.8 I		-132.6	10.4
1.43881E+09	RCPT	-112.0	103.0	30.0	-158.3	57.6 I		-55.3	-678.0	-473.7 I		-575.0	11.6
2.03325E+09	EMTR	-124.1	103.0 I		-184.1	43.0	30.0	-81.1					
2.70596E+09	RCPT	-134.5	103.0	30.0	-194.6	43.0 I		-91.6					
4.82543E+09	EMTR	-149.7	103.0 I		-269.7	43.0	30.0	-106.7					
5.03907E+09	RCPT	-159.1	103.0		-219.1	43.0 I		-116.1					

FIGURE 16

SAMPLE OUTPUT - SGR UNRESOLVED INTERFERENCE

BASELINE SYSTEM INTERFERENCE FROM TOTAL SIGNAL

RCPT -- SUBS = CNI   EQPT 1 = UHFCO PORT 2 = CCHLO   (UNCHANGED)

NOTE - R = IN REQD RANGE, I -- INTERPOLATED VALUE

FREQUENCY (HERTZ)	RECEPTOR SUSC LEVEL	EMI MARGIN	TOTAL RCVD SIGNAL
7.6800E+03	103.0	7.0	110.1
1.5360E+04	103.0	1.0	104.0
3.0720E+04	103.0	-5.0	98.0
6.1440E+04	103.0	-11.0	92.0
1.2268E+05	103.0	-14.4	88.6
2.4576E+05	103.0	-17.4	85.6
4.9152E+05	103.0	-20.4	82.7
9.8304E+05	103.0	-24.9	78.1
1.9661E+06	103.0	-30.6	72.4
3.9322E+06	103.0	-35.7	67.4
7.8643E+06	103.0	-42.2	60.8
1.5729E+07	103.0	-47.3	55.8
3.1457E+07	103.0	-51.1	51.9
6.2915E+07	103.0	-51.7	51.3
1.2583E+08	103.0	-34.7	68.3
2.5166E+08	-27.0 R	106.0	79.0
5.0332E+08	-27.0 R	96.9	69.9
1.0066E+09	103.0	-92.0	11.0
2.0133E+09	103.0	-103.3	-.3
4.0265E+09	103.0	-109.2	-6.2
8.0531E+09	103.0	-174.3	-71.3
1.6106E+10	103.0	-1103.0	-1000.0
3.2212E+10	103.0	-1103.0	-1000.0

TOTAL INTEGRATED EMI MARGIN = 38.4

FIGURE 18
SAMPLE OUTPUT - CEAR SURVEY TOTAL SIGNAL EMI

BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPO   EQPT 4 = IMPYL   PORT 3 = IPAX   (UNCHANGED)

RCPT -- SUBS = GNI   EQPT 1 = UHFCO   PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	PECEPTOR SUSC LEVEL	EMI MARGIN	NARROWBAND RECEIVED SIGNAL	NARROWBAND EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	BROADBAND RECEIVED SIGNAL	BROADBAND EMITTER SPCT LEVEL	BDWDTH FACTOR
1.06076E+04	EMTR	-186.0	103.0 I	-246.9	-143.8	42.1 I				
1.53630E+04	RCPT	-186.0	103.0 I	-246.9	-143.8	42.1 I				
2.03625E+04	EMTR	-186.0	103.0 I	-246.8	-143.8	42.1 I				
3.07200E+04	RCPT	-186.0	103.0 I	-246.8	-143.8	42.1 I				
3.90795E+04	EMTR	-186.0	103.0 I	-246.8	-143.8	42.1 I				
6.14400E+04	RCPT	-185.0	103.0 I	-246.8	-143.8	42.1 I				
7.50098E+04	EMTR	-181.0	103.0 I	-241.9	-138.9	42.1 I				
1.22880E+05	RCPT	-162.9	103.0 I	-223.8	-120.6	42.1 I				
1.43736E+05	EMTR	-158.4	103.0 I	-219.3	-116.2	42.1 I				
2.45760E+05	RCPT	-138.8	103.0 I	-199.7	-96.7	42.1 I				
2.76242E+05	EMTR	-135.7	103.0 I	-196.6	-93.6	42.1 I				
4.91520E+05	RCPT	-114.7	103.0 I							
5.30413E+05	EMTR	-113.4	103.0 I							
9.83040E+05	RCPT	-106.9	103.0 I							
1.00000E+06	EMTR	-106.0	103.0 I	-97.6	5.4	112.3 IR	-295.8	-195.8	-21.0 IR	-69.0
1.01808E+06	EMTR	-106.9	103.0 I	-66.8	36.2	143.1 R	-168.0	-65.0	108.0 R	-60.0
1.95410E+06	EMTR	-106.7	103.0 I	-66.7	36.3	143.1 R	-127.6	-24.6	142.2 R	-60.0
1.96608E+06	RCPT	-106.7	103.0 I	-66.6	36.4	143.1 R	-126.7	-23.7	143.2 R	-60.0
3.75070E+06	EMTR	-107.2	103.0 I	-66.2	36.4	143.1 IR	-126.7	-23.7	143.2 R	-60.0
3.93216E+06	RCPT	-107.5	103.0 I	-67.1	35.9	143.1 R	-126.6	-23.6	143.2 R	-60.0
4.00000E+06	EMTR	-107.7	103.0 I	-67.4	35.6	143.1 IR	-126.6	-23.6	143.2 R	-60.0
5.00000E+06	EMTR	-109.6	103.0 I	-67.6	35.4	143.1 R	-127.1	-24.1	143.2 R	-60.0
7.19910E+06	EMTR	-112.4	103.0 I	-132.3	-29.2	83.1 I	-127.3	-24.3	143.2 R	-60.0
7.86432E+06	RCPT	-113.0	103.0 I	-135.6	-32.0	80.4 I	-127.6	-24.6	143.2 R	-60.0
1.34140E+07	EMTR	-117.2	103.0 I	-157.1	-54.1	63.1 I	-219.4	-116.4	53.2 R	-60.0
1.57286E+07	RCPT	-118.1	103.0 I	-162.1	-59.1	59.1 I	-135.2	-32.2	83.2 I	-3.0
3.66223E+07	EMTR	-121.2	103.0 I	-182.1	-79.1	42.1 I	-138.2	-35.2	80.5 I	-2.5
3.14573E+07	RCPT	-121.9	103.0 I	-182.8	-79.8	42.1 I	-158.7	-55.7	63.2	-1.0
5.09069E+07	EMTR	-123.2	103.0 I	-184.1	-81.1	42.1 I	-370.1	-267.1	-146.0 I	-1.0
6.91446E+07	RCPT	-122.5	103.0 I	-183.4	-80.4	42.1 I				
9.77109E+07	EMTR	-118.3	103.0 I	-179.1	-76.1	42.1 I				
1.25829E+08	RCPT	-105.5	103.0 I	-166.4	-63.4	42.1 I				
1.82542E+08	EMTR	-89.5	28.2 IR	-75.8	-47.4	42.1				
2.51658E+08	RCPT	-92.1	-27.0 IR	-23.0	-49.9	42.1 I				
3.59978E+08	EMTR	-95.2	-27.0 IR	-26.1	-53.1	42.1 I				
5.03316E+08	RCPT	-98.1	-27.0 R	-29.0	-56.0	42.1 I				
6.99942E+08	EMTR	-132.5	32.4 I	-122.8	-90.4	42.1 I				
1.00663E+09	RCPT	-154.0	103.0 I	-214.9	-111.9	42.1 I				
1.32620E+09	EMTR	-160.5	103.0 I	-221.4	-118.3	42.1				
2.01327E+09	RCPT	-164.1	103.0 I	-225.0	-122.0	42.1 I				
2.54551E+09	EMTR	-166.1	103.0 I	-227.8	-124.0	42.1 I				
4.02653E+09	RCPT	-170.1	103.0 I	-231.0	-126.0	42.1 I				

FIGURE 17

SAMPLE OUTPUT - CEAR SURVEY PORT PAIR EMI SUMMARY

BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = INGPD EQPT 4 = INFYL PORT 3 = IPAX (UNCHANGED)

RCPT -- SUBS = CNI EQPT 1 = UMECO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT (CONT D)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	EMI MARGIN	-----NARROWBAND-----			-----BROADBAND-----		
					RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
4.86585E+09	EMTR	-171.8	105.0 I	-232.7	-129.7	42.1				
8.05306E+09	RCPT	-176.1	103.0	-237.0	-134.0	42.1 I				
9.37935E+09	EMTR	-172.5	103.0 I	-238.3	-135.3	42.1				
1.61061E+10	RCPT	-182.2	103.0	-243.0	-140.0	42.1 I				
1.80996E+10	EMTR	-183.1	103.0 I	-244.0	-141.0	42.1				

INTEGRATED EMI MARGIN = 9.5

FIGURE 17 (Continued)
SAMPLE OUTPUT - CEAR SURVEY PORT PAIR EMI SUMMARY

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An output is also printed giving the margins to the total received signal, and an example of such an output is shown in Figure 18. The format is similar to the SGR Receptor Spectrum Adjustment Summary except that no adjustment data is printed.

4.2.3 Trade-Off and Waiver Outputs

These outputs are similar to those for the baseline EMC survey. If there was a path between a given port pair in the baseline system analysis, the baseline EMI margin and the change in the margin are also printed. If one or both ports were added or there was no path in the baseline system, the outputs are the same as for the baseline survey. The trade-off and waiver analysis outputs are illustrated in Figures 19 and 20.

4.2.4 Supplemental Outputs

TART has two types of outputs, normal and supplemental. The normal outputs, described above, do not provide information on emitter-receptor pair coupling other than the composite transfer ratio. The supplemental outputs provide such information, but because they may be quite voluminous, these outputs are optional. These outputs are printed if the SP option is specified on the TART control card.

4.2.4.1 Antenna-to-Antenna Coupling Supplemental Outputs – The antenna coupling math model routine outputs provide information on propagation path and the factors involved in computing the path loss. The basic format, as shown in Figure 21, is used for coupling on aircraft where the wings are not in the propagation path, coupling on spacecraft, and coupling over ground. The first two parameters, ISEG and IAP, apply to antenna-to-wire and are always zero for antenna-to-antenna coupling. The next two lines give the location coordinates of the two antennas and the main beam angles. For aircraft, the cylindrical coordinates (RHO and THETA) and wing location codes (LWA) are given. (The LWA codes are in Table 5.) Following these outputs, the antenna pattern model parameters are given. They are THO and PHO, the antenna main beam angles in radians; TH and PH, the look-angles between antennas; G, the computed antenna gain in dB; and IERR, the error code. Each of these parameters has an "X" or "R" suffix to indicate transmitting and receiving antennas, respectively.

In the next line the basic propagation parameters are given. The first four designate the propagation path, and their meanings are given in Tables 6 through 8. As an example use of this code, Figure 21 shows ISH = 10, ISHW = 0, IROX = 0, and IRO = 13. From Table 6, the ISH code indicates that wing shading was considered but rejected because the path did not intersect the wing. ISHW and IROX are zero since there is no wing shading. (They are always zero for spacecraft and ground systems.) Parameter IRO designates the path model used. The first digit gives the relation to the vehicle body, and the second digit gives the path. In this case, both antennas are on the fuselage, and the path was computed using the conical spiral model.

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BASELINE SYSTEM INTERFERENCE FROM TOTAL SIGNAL

RCPT -- SUBS = CNI   EQPT 1 = UHFCO PORT 2 = CCMLO (UNCHANGED)

NOTE - R = IN REQD RANGE, I -- INTERPOLATED VALUE

FREQUENCY (HERTZ)	RECEPTOR SUSC LEVEL	EMI MARGIN	TOTAL RCVD SIGNAL
7.6800E+03	103.0	7.8	110.1
1.5360E+04	103.0	1.0	104.0
3.8738E+04	103.0	-5.0	98.0
6.1440E+04	103.0	-11.0	92.0
1.2288E+05	103.0	-14.4	88.6
2.4576E+05	103.0	-17.4	85.6
4.9152E+05	103.0	-20.4	82.7
9.8304E+05	103.0	-24.9	78.1
1.9661E+06	103.0	-30.6	72.4
3.9322E+06	103.0	-35.7	67.4
7.8643E+06	103.0	-42.2	60.8
1.5729E+07	103.0	-47.3	55.8
3.1457E+07	103.0	-51.1	51.9
6.2915E+07	103.0	-51.7	51.3
1.2583E+08	103.0	-34.7	68.3
2.5166E+08	-27.0 R	136.0	79.0
5.0332E+08	-27.0 R	96.9	69.9
1.0066E+09	103.0	-92.0	11.0
2.0133E+09	103.0	-103.3	-.3
4.0265E+09	103.0	-109.2	-6.2
8.0531E+09	103.0	-174.3	-71.3
1.6106E+10	103.0	-1103.0	-1000.0
3.2212E+10	103.0	-1103.0	-1000.0

TOTAL INTEGRATED EMI MARGIN = 38.4

FIGURE 18
SAMPLE OUTPUT - CEAR SURVEY TOTAL SIGNAL EMI

MODIFIED SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -> SUBS = IMGPD EQPT 4 = INFYL PORT 3 = IPAX (MODIFIED)

RCPT -> SUBS = CNI   EQPY 1 = UHEQO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN RFGQ RANGE, I = INTERPOLATED VALUE

FIGURE 19

SAMPLE OUTPUT - CEAR TRADE-OFF OR WAIVER ANALYSIS

MODIFIED SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMSPD EQPT 4 = INFYL PORT 3 = IPAX (MODIFIED)

RCPT -- SUBS = CNI EQPT 1 = UHFCO PORT 2 = COMLQ (UNCHANGED)

PATH = ANT TO ANT   (CONT D)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEV	MOD EMI MARGIN	3L EMI MARGIN	NARROWBAND MARGIN CHANGE	MOD RCV SIGNAL	MOD EMTR SPCT LEV	MOD EMI MARGIN	3L EMI MARGIN	BROADBAND MARGIN CHANGE	MOD RCV SIGNAL	MOD EMTR SPCT LEV	BDW FCTR
4.80635E+09	EMTR	-171.6	103.0 I	-233.4	-232.7	-.3	-133.4	-1.4						
7.06100E+09	RCVT	-174.1	103.0	-237.8	-237.0	-.0	-137.8	-1.0 I						
9.17232E+09	EMI2	-117.5	103.0 I	-239.1	-238.3	-.8	-136.1	-41.9						
1.11051E+10	RCPT	-152.2	103.0	-243.8	-243.0	-.3	-142.8	-1.04 I						
1.40703E+10	EMI2	-103.1	103.0 I	-244.8	-244.0	-.3	-141.8	-1.4						

INTEGRATED EMI MARGIN = 5.4
BASELINE SYSTEM INTEGRATED EMI MARGIN = 5.5
DIFFERENCE = -.1

FIGURE 19 (Continued)
SAMPLE OUTPUT - CEAR TRADE-OFF OR WAIVER ANALYSIS

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MODIFIED SYSTEM INTERFERENCE FROM TOTAL SIGNAL

RCPT -- SUBS = CNI   EQPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	RECEPTOR SUSC LEVEL	MOD EMI MARGIN	OL EMI MARGIN	MARGIN CHANGE	TOTAL RCVD SIG
7.6800E+03	103.0	-142.5	-142.5	-.0	-39.5
1.5360E+04	103.0	-142.6	-142.6	-.0	-39.5
3.0720E+04	103.0	-142.6	-142.6	-.0	-39.5
6.1440E+04	103.0	-142.6	-142.6	-.0	-39.6
1.2288E+05	103.0	-142.7	-142.7	-.0	-39.7
2.4576E+05	103.0	-142.8	-142.8	-.0	-39.8
4.9152E+05	103.0	-138.1	-138.2	.1	-35.1
9.8304E+05	103.0	-42.7	-42.6	-.0	60.2
1.9661E+06	103.0	-42.5	-42.5	-.0	60.5
3.9322E+06	103.0	-42.4	-42.4	-.0	60.6
7.8643E+06	103.0	-101.6	-103.1	1.5	1.4
1.5729E+07	103.0	-125.7	-127.5	1.8	-22.7
3.1457E+07	103.0	-153.0	-153.0	-.0	-50.0
6.2915E+07	103.0	-154.4	-154.4	-.0	-51.4
1.2583E+08	103.0	-121.4	-121.4	-.0	-18.4
2.5166E+08	-27.0 R	6.0	6.0	-.0	-20.0
5.0332E+08	-27.0 R	-.0	-.0	-.0	-27.0
1.0066E+09	103.0	-154.0	-152.4	-1.7	-51.0
2.0133E+09	103.0	-196.0	-196.0	-.0	-93.0
4.0265E+09	103.0	-127.3	-127.3	-.0	-24.3
8.0531E+09	103.0	-174.3	-174.3	-.0	-71.3
1.6106E+10	103.0	-1103.0	-1103.0	-.0	-1000.0
3.2212E+10	103.0	-1103.0	-1103.0	-.0	-1000.0

TOTAL INTEGRATED EMI MARGIN =   38.2
BASELINE SYSTEM TOTAL INTEGRATED EMI MARGIN =   38.4
DIFFERENCE =   - -.2

FIGURE 20
SAMPLE OUTPUT - CEAR TRADE-OFF OR WAIVER ANALYSIS TOTAL SIGNAL EMI

```
ISEG= 0  IAL= 0
             X        Y        Z       RHO       TH       THO      PHJ     LWA
XMTR       0.0     55.0    224.0     55.0    1.5708   0.0000   0.0000     1
RCP7       0.0    -25.0    129.0     25.0    4.7124   0.0000   0.0000     1


THBX,PHBX,THX,PHX,GX,IERR
    0.00000   0.00000   2.27069   6.29319  -1.68045  0
THBR,PHBR,THR,PHR,GR,IERR
    0.00000   0.00000    .87090   3.14159  -1.68038  0

         ISH ISHW IROX IRO    DMIN      OWR     TFS      PRP     SFWF     SFC      GX       GR
          10   0    0   13   103.2      0.0   -101.2    139.2     0.0    -57.6    -1.7     -1.7

    NO WING SHADING
        FREQ       TFS      SFC      SFW       PRP
    RCPI FREQS
      7.6800E+03    0.0     -.2      0.0      -3.6
      1.5360E+04    0.0     -.3      0.0      -3.7
      3.0720E+04    0.0     -.4      0.0      -3.8
      6.1440E+04    0.0     -.6      0.0      -4.0
      1.2288E+05    0.0     -.9      0.0      -4.2
      2.4576E+05    0.0    -1.2      0.0      -4.6
      4.9152E+05    0.0    -1.7      0.0      -5.1
      9.8304E+05    0.0    -2.4      0.3      -5.8
      1.9661E+06    0.0    -3.4      0.3      -6.8
      3.9322E+06    0.0    -4.8      0.0      -8.2
      7.8643E+06    0.0    -6.7      0.0     -10.1
      1.5729E+07   -4.8    -9.4      0.0     -17.5
      3.1457E+07  -10.8   -13.0      0.0     -27.1
      6.2915E+07  -16.8   -17.8      0.0     -38.0
      1.2583E+08  -22.8   -24.2      0.0     -53.4
      2.5166E+08  -28.8   -32.5      0.0     -54.7
      5.0332E+08  -34.9   -43.2      0.0     -61.5
      1.0066E+09  -40.9   -57.7      0.0    -101.9
      2.0133E+09  -46.9   -75.6      0.0    -125.8
      4.0265E+09  -52.9   -96.8      0.0    -153.0
      8.0531E+09  -58.9  -120.7      0.0    -183.0
      1.6106E+10  -65.0  -146.3      0.0    -214.5
      3.2212E+10  -71.0  -172.0      0.0    -245.4
    EMTR FREQS
      8.0303E+03    0.0     -.2      0.0      -3.6
      1.6607E+04    0.0     -.3      0.0      -3.7
      3.1233E+04    0.0     -.4      0.0      -3.8
      5.8739E+04    0.0     -.6      0.0      -4.0
      1.1047E+05    0.0     -.8      0.0      -4.2
      2.0776E+05    0.0    -1.1      0.0      -4.5
      3.9073E+05    0.0    -1.5      0.0      -4.9
      7.3465E+05    0.0    -2.1      0.0      -5.5
      1.3820E+06    0.0    -2.9      0.0      -6.2
      2.5991E+06    0.0    -3.9      0.0      -7.3
      4.8882E+06    0.0    -5.3      0.3      -8.7
      9.1932E+06    -.1    -7.3      0.0     -10.7
      1.7290E+07    -.5    -9.8      0.0     -19.7
      3.2516E+07          -13.2      0.0     -27.6
      6.1153E+07          -17.6      0.0     -37.5
      1.1501E+08          -23.3      0.0     -48.7
      2.1630E+08          -30.5      0.0     -61.4
      4.0679E+08     -.8   -39.4      0.0     -75.8
      7.6504E+08  -38.5   -51.6      0.0     -93.4
      1.0390E+09  -41.1   -58.2      0.0    -102.7
      1.0900E+09  -41.6   -59.6      0.0    -104.5
      1.4388E+09  -44.0   -66.5      0.0    -113.8
      2.7060E+09  -49.5   -84.2      0.0    -137.1
```

FIGURE 21
SAMPLE ANTENNA-TO-ANTENNA COUPLING SUPPLEMENTAL OUTPUT
BASIC FORMAT

TABLE 5

WING ANTENNA CODE (LWA)

LWA	MEANING
1	Not on wing
2	On or suspended from wing bottom
3	Top of wing
4	Forward edge of wing
5	Aft edge of wing
6	Tip of wing

TABLE 5

WING ANTENNA CODE (LWA)

LWA	MEANING
1	Not on wing
2	On or suspended from wing bottom
3	Top of wing
4	Forward edge of wing
5	Aft edge of wing
6	Tip of wing

TABLE 6

SHADING/PATH AROUND VEHICLE CODE (ISH)

ISH	MEANING
1	TOP OF FUSELAGE ONLY
2	BOTTOM OF FUSELAGE ONLY
3	OVER RIGHT WING ONLY
4	OVER LEFT WING ONLY
5	FUSELAGE TO RIGHT WING
6	FUSELAGE TO LEFT WING
7	FUSELAGE TO RIGHT WING TO FUSELAGE
8	FUSELAGE TO LEFT WING TO FUSELAG
9	FREE SPACE
10	WING SHADING CONSIDERED BUT REJECTED BECAUSE PATH DOES NOT INTERSECT WING

TABLE 7

WING EDGE CODE (ISHW)

ISHW	MEANING
0	NOT AROUND WING
1	FWD EDGE
2	AFT EDGE

TABLE 8

ANTENNA – FUSELAGE CODE, XMTR ANT TO WING (IROX) AND
ANTENNA – FUSELAGE CODE, WING TO RCVR ANT (IRO)

FIRST DIGIT (RELATION TO BODY)				
	$IROX^2$		IRO^2	
VALUE	TRANSMITTER ANTENNA	WING POINT	WING POINT (XMTR IF NO WING SHADING)	RECEIVER ANTENNA
1	ON	ON	ON	ON
2	ON	OFF	ON	OFF
3	OFF	ON	OFF	ON
4	OFF	OFF	OFF	OFF
BLANK	(SEE NOTE 1)		(SEE NOTE 1)	

SECOND DIGIT (CURVE)	
VALUE	CURVE USED
0	STRAIGHT LINE ONLY
1	STRAIGHT LINE AND CYLINDRICAL SPIRAL
2	CYLINDRICAL SPIRAL ONLY
3	CONICAL SPIRAL ONLY

NOTES:

1. BLANK IF ANTENNAS HAVE SAME θ COORDINATES OR FREE SPACE

2. IF NO WING SHADING, IROX IS ZERO AND IRO CODE APPLIES FOR TRANSMITTER ANTENNA TO RECEIVER ANTENNA

ISEG= 0 IAP= 0

	X	Y	Z	RHO	TH	THO	PHO	LWA
XMTR	81.5	-45.0	210.0	93.1	5.7787	1.7453	0.0000	2
RCPT	0.0	113.0	625.0	113.0	1.5708	0.0000	0.0000	1

THOX,PHOX,THX,PHX,GX,IERR
1.74533 0.00000 1.47169 3.17766 -20.00000 0
THOR,PHOR,THR,PHR,GR,IERR
0.00000 0.00000 2.17801 .41266 -1.48466 0

THOX,PHOX,THX,PHX,GX,IERR
1.74533 0.00000 .76060 4.19732 -20.00000 0
THOR,PHOR,THR,PHR,GR,IERR
0.00000 0.00000 1.87328 .13664 -7.62128 0

ISH	ISHW	IROX	IRO	DMIN	DWR	TFS	PRP	SFWP	SFC	GX	GR
7	2	0	31	49.3	405.6	-76.5	145.6	79.0	-4.0	-20.0	-7.6

ISH	ISHW	IROX	IRO	DMIN	DWR	TFS	PRP	SFWP	SFC	GX	GR
7	1	40	41	255.1	223.8	-87.8	131.3	71.9	-.0	-20.0	-1.5

		FORWARD EDGE				AFT EDGE			
FREQ	TFS	SFC	SFW	PRP	TFS	SFC	SFW	PRP	PROP
RCPT FREQS									
7.6800E+03	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.6	-21.5
1.5360E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.6	-21.5
3.0720E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.6	-21.5
6.1440E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.7	-21.5
1.2288E+05	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.7	-21.5
2.4576E+05	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.7	-21.5
4.9152E+05	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.7	-21.5
9.8304E+05	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.7	-21.5
1.9661E+06	0.0	-.0	0.0	-21.5	0.0	-.2	0.0	-27.8	-21.5
3.9322E+06	-.6	-.0	0.0	-22.1	0.0	-.3	0.0	-27.9	-22.1
7.8643E+06	-6.6	-.0	0.0	-28.1	0.0	-.4	0.0	-28.0	-28.0
1.5729E+07	-12.6	-.0	-.1	-34.2	0.0	-.5	0.0	-28.1	-28.1
3.1457E+07	-18.6	-.0	-3.1	-43.2	-4.3	-.7	0.0	-32.7	-32.7
6.2915E+07	-24.7	-.0	-6.1	-52.3	-10.4	-1.0	0.0	-39.0	-39.0
1.2583E+08	-30.7	-.0	-9.1	-61.3	-16.4	-1.4	-2.0	-47.4	-47.4
2.5166E+08	-36.7	-.0	-12.1	-70.3	-22.4	-2.0	-5.0	-57.1	-57.1
5.0332E+08	-42.7	-.0	-15.2	-79.4	-28.4	-2.5	-8.0	-66.9	-66.9
1.0066E+09	-48.7	-.0	-18.2	-88.4	-34.5	-.0	-11.0	-77.1	-77.1
2.0133E+09	-54.8	-.0	-21.2	-97.4	-40.5	-5.6	-14.0	-67.7	-67.7
4.0265E+09	-60.8	-.0	-24.2	-106.4	-46.3	-7.8	-17.1	-99.0	-99.0
8.0531E+09	-66.8	-.0	-27.2	-115.5	-52.5	-10.9	-20.1	-111.1	-111.1
1.6106E+10	-72.8	-.0	-30.2	-124.5	-58.5	-15.0	-23.1	-124.3	-124.3
3.2212E+10	-78.8	-.0	-33.2	-133.5	-64.5	-20.6	-26.1	-136.8	-133.5
EMTR FREQS									
1.0608E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.6	-21.5
2.0360E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.6	-21.5
3.9080E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.6	-21.5
7.5009E+04	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.7	-21.5
1.4397E+05	0.0	-.0	0.0	-21.5	0.0	-.0	0.0	-27.7	-21.5
2.7636E+05	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.7	-21.5
5.3041E+05	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.7	-21.5
1.0000E+06	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.8	-21.5
1.0181E+06	0.0	-.0	0.0	-21.5	0.0	-.1	0.0	-27.8	-21.5
1.9541E+06	0.0	-.0	0.0	-21.5	0.0	-.2	0.0	-27.8	-21.5
3.7507E+06	-.2	-.0	0.0	-21.6	0.0	-.2	0.0	-27.9	-21.6
4.0000E+06	-.7	-.0	0.0	-22.2	0.0	-.3	0.0	-27.9	-22.2
5.0000E+06	-2.7	-.0	0.0	-24.1	0.0	-.3	0.0	-27.9	-24.1
7.1991E+06	-5.8	-.0	0.0	-27.3	0.0	-.3	0.0	-25.0	-27.3

FIGURE 22

SAMPLE ANTENNA-TO-ANTENNA COUPLING SUPPLEMENTAL OUTPUT WITH WING SHADING

```
 ISEG=  1  IAP=  2
              X        Y        Z      RHO       TH      THO     PHO     LWA
XMTR         0.0     55.0    374.0     55.0    1.5708  0.0000  0.0000    1
RCPT         0.0     77.2    332.5     52.2    1.5708  0.0000  0.0000    1


THOX,PHOX,THX,PHX,GX,IERR
  0.00000   0.00000   1.63816   6.28319 -17.86000   0

       ISM ISHW IROX  IRO    DMIN     DWR      TFS      PRP     SFWF      SFC       GX       GR
        9    8    0    0     41.6     0.0     -73.8    114.4     0.0      0.0      -17.9     0.0


      FREQ       SFC       SFW       PRP      PRPA     AWRTO       YE        YR       TRNSF
RCPT FREQS
   7.6800E+03    0.0       0.0      -3.6       .0   1.3974E-05  2.0000E-02  2.0000E+00  1.7106E-06
   1.5360E+04    0.0       0.0      -3.6       .0   2.7948E-05  2.0000E-02  2.0000E+00  6.8663E-06
   3.0720E+04    0.0       0.0      -3.6       .0   5.5836E-05  2.0000E-02  2.0000E+00  2.7465E-07
   6.1440E+04    0.0       0.0      -3.6       .0   1.1179E-04  2.0000E-02  2.0000E+00  1.0986E-06
   1.2288E+05    0.0       0.0      -3.6       .0   2.2358E-04  2.0000E-02  2.0000E+00  4.3945E-06
   2.4576E+05    0.0       0.0      -3.6       .0   4.4716E-04  2.0000E-02  2.0000E+00  1.7578E-05
   4.9152E+05    0.0       0.8      -3.6       .0   8.9433E-04  2.0000E-02  2.0000E+00  7.0311E-05
   9.8304E+05    0.0       0.0      -3.6       .0   1.7867E-03  2.0000E-02  2.0000E+00  2.8125E-04
   1.9661E+06    0.3       0.0      -3.6       .0   3.5773E-03  2.0000E-02  2.0000E+00  1.1250E-03
   3.9322E+06    0.0       0.0      -3.6       .0   7.1546E-03  2.0000E-02  2.0000E+00  4.4999E-03
   7.8643E+06    0.0       0.0      -3.6       .0   1.4302E-02  2.0000E-02  2.0000E+00  1.8000E-02
   1.5729E+07    0.0       0.0      -3.6       .1   2.8619E-02  2.0000E-02  2.0000E+00  7.1999E-02
   3.1457E+07    0.0       0.0      -3.6       .3   5.7237E-02  2.0000E-02  2.0000E+00  2.8799E-01
   6.2915E+07    0.0       0.0      -3.6       .2   4.8987E-02  2.0000E-02  2.0000E+00  2.1095E-01
   1.2583E+08    0.0       0.0      -3.6       .1   2.9251E-02  2.0000E-02  2.0000E+00  7.5219E-02
   2.5166E+08    0.0       0.0      -3.6       .1   2.9251E-02  2.0000E-02  2.0000E+00  7.5219E-02
   5.0332E+08    0.0       0.0      -3.6       .1   2.9251E-02  2.0000E-02  2.0000E+00  7.5219E-02
EMTR FREQS
   1.1969E+04    0.0       0.0      -3.6       .0   2.1718E-05  2.0000E-02  2.0000E+00  4.1692E-08
   2.5303E+04    0.0       0.0      -3.6       .0   4.6039E-05  2.0000E-02  2.0000E+00  1.8633E-07
   5.3492E+04    0.0       0.0      -3.6       .0   9.7330E-05  2.0000E-02  2.0000E+00  8.3276E-07
   1.1309E+05    0.0       0.0      -3.6       .0   2.0576E-04  2.0000E-02  2.0000E+00  3.7218E-06
   2.3957E+05    0.0       0.0      -3.6       .0   4.3499E-04  2.0000E-02  2.0000E+00  1.6634E-05
   5.0540E+05    0.0       0.0      -3.6       .0   9.1959E-04  2.0000E-02  2.0000E+00  7.4339E-05
   1.0685E+06    0.0       0.0      -3.6       .0   1.9441E-03  2.0000E-02  2.0000E+00  3.3224E-04
   2.2588E+06    0.0       0.0      -3.6       .0   4.1099E-03  2.0000E-02  2.0003E+00  1.4849E-03
   4.7752E+06    0.0       0.0      -3.6       .0   8.6855E-03  2.0000E-02  2.0000E+00  6.6362E-03
   1.0095E+07    0.0       0.0      -3.6       .0   1.8350E-02  2.0000E-02  2.0000E+00  2.9659E-02
   2.1341E+07    0.0       0.0      -3.6       .1   3.8831E-02  2.0000E-02  2.0000E+00  1.3255E-01
   4.5117E+07    0.0       0.0      -3.6       .4   6.6311E-02  2.0000E-02  2.0000E+00  4.1022E-01
   9.5380E+07    0.0       0.0      -3.6       .1   3.2313E-02  2.0000E-02  2.0000E+00  9.1767E-02
   2.0164E+08    0.0       0.0      -3.6       .1   2.9251E-02  2.0000E-02  2.0000E+00  7.5219E-02
   4.2627E+08    0.0       0.0      -3.6       .1   2.9251E-02  2.0000E-02  2.0000E+00  7.5219E-02
   8.0000E+08    0.0       0.0      -3.6       .1   2.9251E-02  2.0000E-02  2.0000E+00  7.5219E-02
```

FIGURE 23
SAMPLE ANTENNA-TO-WIRE COUPLING SUPPLEMENTAL OUTPUT

FREQUENCY	XFERV	XFERI
3.00000E+01	1.15989E-08	2.66499E-03
6.34217E+01	2.43911E-08	5.38444E-03
1.34077E+02	5.11685E-08	1.03347E-02
2.83447E+02	1.06969E-07	1.63409E-02
5.99222E+02	2.22487E-07	1.88021E-02
1.26679E+03	4.69353E-07	1.54947E-02
2.67807E+03	9.38284E-07	9.38089E-03
5.66159E+03	1.88697E-06	4.77718E-03
1.19689E+04	3.71020E-06	2.30063E-03
2.53030E+04	7.06057E-06	1.09272E-03
5.34919E+04	1.28172E-05	5.17357E-04
1.13085E+05	2.17428E-05	2.44773E-04
2.39068E+05	3.35001E-05	1.15789E-04
5.05404E+05	4.51926E-05	5.47715E-05
1.06845E+06	5.14950E-05	2.59083E-05
2.25877E+06	5.03241E-05	1.22552E-05
4.77517E+06	5.24512E-05	5.79703E-06
1.00950E+07	8.12981E-05	2.74213E-06
2.13414E+07	1.64038E-04	1.29710E-06
4.51169E+07	3.46002E-04	6.13557E-07
9.53796E+07	7.31071E-04	2.90227E-07
3.00000E+01	1.15989E-08	2.66499E-03
6.00000E+01	2.30859E-08	5.11332E-03
1.20000E+02	4.58572E-08	9.45925E-03
2.40000E+02	9.08321E-08	1.51353E-02
4.80000E+02	1.79198E-07	1.85753E-02
9.60000E-02	3.51536E-07	1.73134E-02
1.92000E+03	6.84134E-07	1.20972E-02
3.84000E+03	1.31647E-06	6.86203E-03
7.68000E+03	2.49322E-06	3.55677E-03
1.53600E+04	4.61696E-06	1.79642E-03
3.07200E+04	8.28359E-06	9.00379E-04
6.14400E+04	1.42169E-05	4.50453E-04
1.22880E+05	2.29336E-05	2.25264E-04
2.45760E+05	3.3960+E-05	1.12636E-04
4.91520E+05	4.48194E-05	5.63180E-05
9.83040E+05	5.12044E-05	2.81593E-05
1.96608E+06	5.08374E-05	1.40797E-05
3.93216E+06	5.03389E-05	7.03984E-06
7.86432E+06	6.71021E-05	3.51992E-06
1.57286E+07	1.21722E-04	1.75996E-06
3.14573E+07	2.41320E-04	8.79980E-07
6.29146E+07	4.82414E-04	4.39390E-07
1.25829E+08	9.63986E-04	2.19995E-07
2.51658E+08	1.92129E-03	1.09996E-07

FIGURE 24

SAMPLE WIRE-TO-WIRE COUPLING SUPPLEMENTAL OUTPUT

4.3 ERROR CONDITION CODES

IEMCAP performs extensive checks for errors at various stages of execution. When an error occurs, the program prints a message giving the error code and a brief description of the error. In some cases, it prints key parameters to further define the error.

An error condition can be fatal or non-fatal. A fatal error causes execution to terminate and generally results from an unreconcilable situation such as a missing EXEC card or working file misalignment. The majority of the error conditions, however, are non-fatal. The program ignores the bad data or parameters and continues. Although continuing may produce incomplete results, it allows the program to check for additional errors.

The error messages described here are from program-detectable errors. They are conditions which the program logic is able to detect and are different from computer-detectable errors. The latter are detected by the system support software for the particular computer and are not controllable by IEMCAP. A memory overflow is an example of a computer-detectable error.

In some of the error messages, alpha ID's are printed in IEMCAP internal code consisting of a 10 digit number. This is broken into five groups of 2 digits each. (The number may be 9 digits in which the first group is one digit with a suppressed leading zero.) The character associated with each group is obtained from Table 9 to form the ID. For example, the code 1801040118 is broken into groups 18-01-04-01-18 which, from Table 9, is RADAR.

4.3.1 IDIPR Errors

There are fifty-eight program detectable errors in IDIPR, of which only three are fatal: exceeding the maximum number of equipments, an EXEC card out of order, or an ISF spectrum ID record not matching a port. The IDIPR error codes are given in Table 10.

4.3.2 TART Errors

After the input data is processed by IDIPR, it is possible that there are still errors in the input that could not be detected by IDIPR. A likely type of error would be a specified component that does not exist, such as a port-associated antenna ID that cannot be matched in the antenna data. Such errors that can be detected by TART cause an error diagnostic to be printed out. The fatal errors are an invalid TART task control card, file alignment errors, invalid system type code, or a zero fuselage radius for a spacecraft. If there were non-fatal errors during a TART run, a message is printed at the end giving the number of errors which occurred. The TART errors are given in Table 11. The TART subroutine is given as an aid to tracing the cause of the error.

TABLE 9

IEMCAP ALPHA ID INTERNAL CODE

CODE	CHARACTER		CODE	CHARACTER
00	blank		19	S
01	A		20	T
02	B		21	U
03	C		22	V
04	D		23	W
05	E		24	X
06	F		25	Y
07	G		26	Z
08	H		27	1
09	I		28	2
10	J		29	3
11	K		30	4
12	L		31	5
13	M		32	6
14	N		33	7
15	O		34	8
16	P		35	9
17	Q		36	0
18	R			

TABLE 10 IDIPR ERRORS

Error Number	Fatal/Non-Fatal	Description
1	NF	No match for keyword - use a legitimate keyword
2	NF	Missing equal sign
3	NF	No match for alpha code - check list of acceptable alpha codes
4	NF	Number of parameters is incorrect
5	NF	Illegal syntax
6	NF	Alphanumeric must begin with alpha
7	NF	Invalid ID syntax - check the input rules
8	NF	Mismatched parenthesis
9	NF	Number of values for inner environmental field, outer environmental field and frequency must be the same
10	NF	Multiple card of the same type
11	NF	Index equals zero or exceeds the maximum
12	NF	Card is out of order
13	NF	Illegal S/R code - check input rules
14	NF	Missing hierarchy data - check input rules
15	NF	Incomplete equipment or bundle data

TABLE 10 IDIPR ERRORS (Continued)

Error Number	Fatal/ Non-Fatal	Description
31	NF	Invalid initial spectrum option - check input rules
32	NF	Invalid spectrum request to SPCMDL
33	NF	Invalid receptor port Source/Receptor (SR) code index
34	NF	Invalid source port SR code index
35	NF	Source and receptor SR codes must be the same for the same port
36	NF	The load impedance is zero - at least one termination component must be non-zero.
37	NF	Electro-explosive device may not be entered as a source, only as a receptor
38	NF	The specification option for a power line has an invalid index
39	NF	The modulation code for a source or receptor has an invalid index
40	NF	The AM modulation index must be between zero and one
41	NF	The signal type code has an invalid index
42	NF	The SR code has a bad index when entering subroutine SCARFE
43	NF	The stated pulse width of a wave form exceeds the pulse separation
44	NF	MIL-STD-461A may not be specified for an EED
45	NF	Incorrectly specified RF power level was detected by subroutine M461

TABLE 10 IDIPR ERRORS (Continued)

Error Number	Fatal/ Non-Fatal	Description
16	NF	Wrong MOD code for job type - check input rules
17	NF	MOD code conflict - check input rules
18	NF	All modifies and deletes must precede adds
19	NF	ID of system component to be deleted cannot be found
20	NF	ID of antenna connected to port cannot be found in system data
21	NF	ID of bundle associated with wire port cannot be found in system data
22	NF	ID of wire connected to port cannot be found in system data
23	NF	The first port of an equipment must be equipment case
24	NF	The frequency table has an error - check frequencies in table
25	NF	Number of ports for equipment is less than one or greater than fifteen
26	NF	SOURCE/RECEPTOR card for port is missing
27	NF	There was an error in initial spectrum generation
28	NF	Number of equipments exceeds the maximum
29	NF	Bundle/wire ID cannot be found in system data. If bundle and wire ID are not in error, look for error in system data.
30	NF	TI and RE must be in columns 1-2

TABLE 10 INTPR ERRORS (Continued)

Error Number	Fatal/ Non-Fatal	Description
46	NF	MIL-STD-704 may not be specified for a power line receptor
47	NF	MIL-I-6181 may not be specified for an EED
48	NF	Invalid duplicate ID
49	NF	Bundle segment point ID is not defined in list of bundle points
50	NF	Wire point ID is not defined in list of bundle points
51	NF	Port bundle point connection is not a legitimate wire point
52	NF	Wire type ID cannot be found in wire characteristics table
53	NF	Bundle segment point indices are identical or invalid. Specify correct bundle points defining the segment
54	NF	A wire either has more than ten segments or it loops on itself. If less than ten segments, ensure that wire cannot form a closed loop
55	NF	The end of a wire does not connect to any port
901	F	The Intrasystem File spectrum ID record does not match port
902	F	EXEC card must precede all data cards except TITLE and REMARKS
903	F	Maximum number of equipments has been exceeded

TABLE 11 TART ERRORS

Error Number	Fatal/Non-Fatal	Subroutine	Description
1	F	TART	Invalid task code
2	F	PAREAD	Invalid tart control card
3	F	PAREAD	Invalid task code on tart control card
4	F	PAREAD	Initial processing and TART tasks incompatible (change task code to agree with IDIPR task)
101	F	CEAR	File alignment error between Baseline Transfer File and URSF (survey and trade-off).*
102	F	CEAR	Baseline Transfer file alignment error. End-of-emitters not read when expected for this receptor and no ports were added. (Probable cause: deleted port during trade-off analysis)
103	F	CEAR	File alignment error between Baseline Trans File and URSF (waiver analysis or trade-off with spectrum changes only).*
104	F	CEAR	UESF file alignment error.* Unexpected end-of-file during waiver analysis or trade-off with spectrum changes only.
201	F	SGR	File alignment error between SCHTR and AESF. Unexpected end-of-file.*
301	F	RCPTRD	File alignment error between REDF and URSF working files. Eqpt indices do not match.*
302	F	RCPTRD	File alignment error between REDF and URSF working files. Subsystem, equipment, and port ID's do not match.*
303	F	RCPTRD	Invalid receptor change code. (Probable cause: deleted port for trade-off analysis.)

* See Section 1.3 for file abbreviations

TABLE 11 TART ERRORS (Continued)

Error Number	Fatal/ Non-Fatal	Subroutine	Description
401	F	EMTRD	File alignment error. Same as 301 except emitter between EEDF and UESF
402	F	EMTRD	File alignment error. Same as 302 except emitter between EEDF and UESF
403	F	EMTRD	Same as 303. Invalid emitter change code.
501	NF	COUPLE	Bundle ID specified by port cannot be found in wire bundle data.
502	NF	COUPLE	Bundle file alignment error. Bundle index in port data does not match the wire map file index for same bundle ID.
503	NF	COUPLE	Wire ID specified for emitter port cannot be found in wire bundle data.
504	NF	COUPLE	Wire ID specified for receptor port cannot be found in wire bundle data.
505	NF	COUPLE	Filter ID specified for emitter port cannot be found in filter data.
506	NF	COUPLE	Filter ID specified for receptor port cannot be found in filter data.
601	NF	ACTFER	Invalid path code.
602	NF	ACTFER	Antenna ID specified for receptor port cannot be found in antenna data.
603	NF	ACTFER	Aperture 1D specified for receptor wire segment cannot be found in aperture data.

TABLE 11 TART ERRORS (Continued)

Error Number	Fatal/Non-Fatal	Subroutine	Description
604	NF	ACTFER	Antenna ID specified for emitter port cannot be found in antenna data.
605	NF	ACTFER	Wire characteristics table ID specified for receptor wire cannot be found in table.
701	NF	GAIN	Bad antenna orientation. Angles outside allowable ranges: $0 \le \Theta_o \le 180°$ and $0 \le \phi_o \le 360°$
702	NF	GAIN	Bad antenna look angles. Angles outside allowable ranges: $0 \le \Theta \le 180°$ and $0 \le \phi \le 360°$
703	NF	GAIN	Bad antenna vertical half-beamwidth. Outside allowable range: $0 \le \Theta_B \le 90°$
704	NF	GAIN	Bad antenna horizontal half-beamwidth. Outside allowable range: $0 \le \phi_B \le 180°$
705	NF	GAIN	Bad antenna sidelobe half-beamwidth. Outside allowable range: $0 \le \phi_{SR} \le 180°$
801	F	VEHSET	Invalid system type code
802	F	VEHSET	Zero fuselage radius specified for spacecraft.
901	NF	WTWTFR	Subscript for emitter wire ID in wire characteristics table out of range
902	NF	WTWTFR	Subscript for receptor wire ID in wire characteristics table out of range

TABLE 11 TART ERRORS (Continued)

Error Number	Fatal/ Non-Fatal	Subroutine	Description
903	NF	WTWTFR	Code for emitter shield configuration out of range
904	NF	WTWTFR	Code for receptor shield configuration out of range
905	NF	WTWTFR	Code for emitter twist/untwist configuration out of range
906	NF	WTWTFR	Code for receptor twist/untwist configuration out of range
907	NF	WTWTFR	Code for emitter balance/unbalance configuration out of range
908	NF	WTWTFR	Code for receptor balance/unbalance configuration out of range
909	NF	WTWTFR	Code for emitter right/left identification out of range
910	NF	WTWTFR	Code for receptor right/left identification out of range
911	NF	WTWTFR	Code for emitter end or internal segment out of range
912	NF	WTWTFR	Code for receptor end or internal segment out of range
913	NF	WTWTFR	Zero emitter wire load admittance
914	NF	WTWTFR	Zero receptor wire load admittance
1001	NF	FILTER	Invalid filter type
1002	NF	FILTER	Invalid filter Q or coupling coefficient
1101	NF	ENVIRN	Antenna ID specified for receptor port cannot be found in antenna data

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TABLE 11 TART ERRORS (Continued)

Error Number	Fatal/Non-Fatal	Subroutine	Description
1102	NF	ENVIRN	Wire type ID specified for receptor port cannot be found in wire characteristics table
1103	NF	ENVIRN	Aperture ID specified for receptor wire cannot be found in aperture data
1104	NF	ENVIRN	Filter ID specified for receptor port cannot be found in filter data

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Section 5

EXAMPLE TEST CASE

In this section, a use of IEMCAP is illustrated by a test case, called the "mini-system." This test case can also be used to verify the operation of IEMCAP on a particular computer by comparing the answers to those reproduced herein. This data is designed to test the various routines and math models in the program and is not necessarily relatable to a physical system. The engineering data is presented along with the resulting IEMCAP inputs and sample computer outputs.

5.1 MINI-SYSTEM DESCRIPTION

The test case system ("mini-system") is an aircraft with physical dimensions as shown in Table 12. These parameters can be related to Figures 3 and 4. The subsystems and equipments which compose the mini-system are shown in a basic schematic diagram in Figure 25. The eight equipments are shown along with their ports and port connections. Each equipment is designated by a subsystem and equipment ID. For example, equipment 1 has equipment ID "UHFCO" and subsystem ID "CNI." Each equipment box location is given in terms of buttline, waterline, and fuselage station in that order. Also given is the compartment ID in which each box is located. (Compartments isolate boxes; that is, no coupling can occur between boxes in different compartments).

Equipment case leakage is taken as the first port in each equipment. All other ports are shown with their ID's for each equipment. For antenna-connected ports, the antenna ID is shown along with the location coordinates. This antenna ID refers to the system-level parameters for the particular antenna type. Note that the same antenna may be deployed at several locations on the aircraft. For wire-connected ports, the bundle and wire ID's, port interconnections, shield terminations, and exposing apertures are shown. Ports are indicated as sources, receptors, or both by inward arrows, outward arrows, or both, respectively.

Wire bundling and routing is shown in Figure 26. Each wire termination, branch, or direction change is represented by a point with an ID and location coordinates, as shown. Also, dielectric aperatures in the aircraft which expose bundle segments are shown with their locations.

With the basic system established, the detailed parameters of the ports are defined. As an example, the equipment case and first intentional port of equipment "UHFCO" of subsystem "CNI" are discussed in detail. This equipment represents a UHF communications transceiver. The EMC specification used as an initial for non-required spectra is MIL-STD-461A.

TABLE 12

MINI-SYSTEM AIRCRAFT PARAMETERS

Conical Nose Limit Fuselage Station	165.0 inches
Fuselage Radius	56.5 inches
Core Radius	18.8 inches
Centroid Water line	2?.0 inches
Bottom Water line	12.0 inches
Bottom Option	FLAT
Wing Root Coordinates	
Butt line	55.0 inches
Water line	12.0 inches
Forward Fuselage Station	225.0 inches
Aft Fuselage Station	456.0 inches
Wing Tip Coordinates	
Butt line	230.0 inches
Water line	16.0 inches
Forward Fuselage Station	435.0 inches
Aft Fuselage Station	490.0 inches
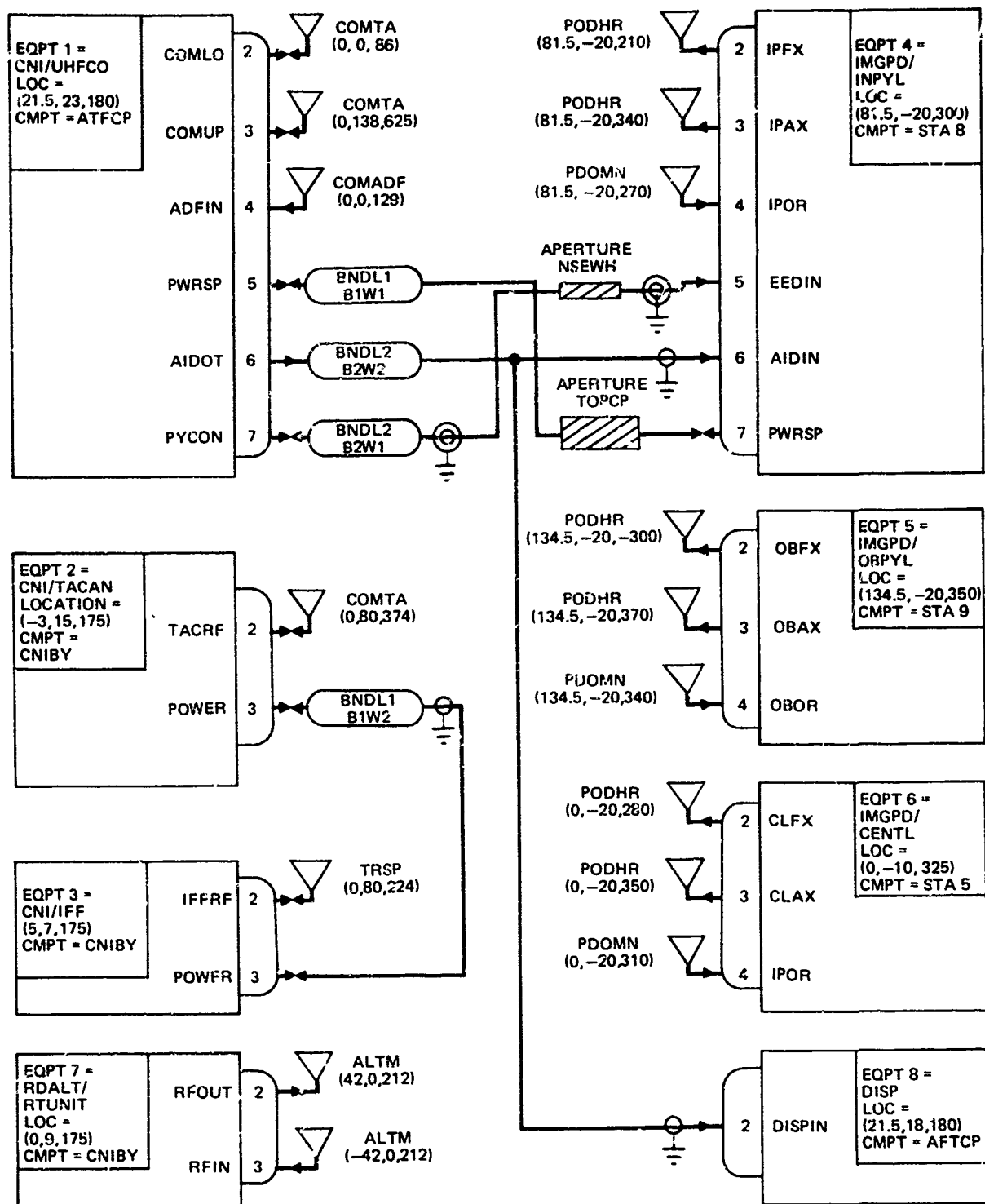
**FIGURE 25
MINI-SYSTEM BASIC SCHEMATIC DIAGRAM**

GP 73 1075 35

111
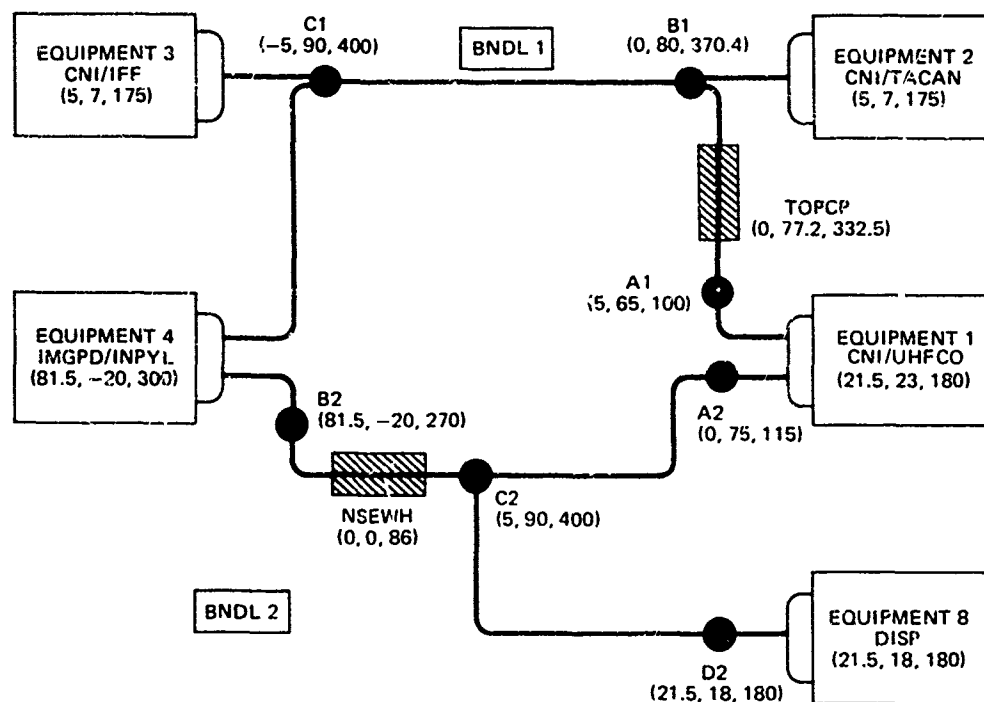
FIGURE 26
MINI-SYSTEM WIRE BUNDLE ROUTING DIAGRAM

GP73 1075

Frequency	Amplitude
100	27.5
100K	27.5
25M	52 6
100M	25.0
1G	−24.6
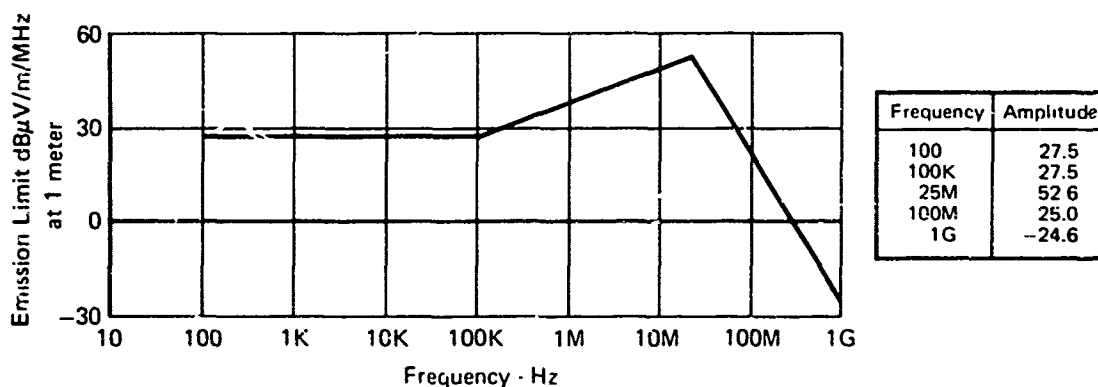
FIGURE 27
BROADBAND EQUIPMENT CASE EMISSION SPECTRUM FOR "UHFCO"

GP73 1075 33

112

ANTENNA = COMTA
TYPE = DIPOLE
POLARIZATION = VERTICAL
LENGTH = 0.2 INCHES

PORT 2 = COMLO

FILTER = FLTR2
XFMR COUPLED STAGE
F_0 = 300 MHz
γ = 1 dB
ISOL = 80 dB
Q = 200
M = 0.1

2

SOURCE
AM VOICE
b = 5 KHz
em = 1

50 Ω
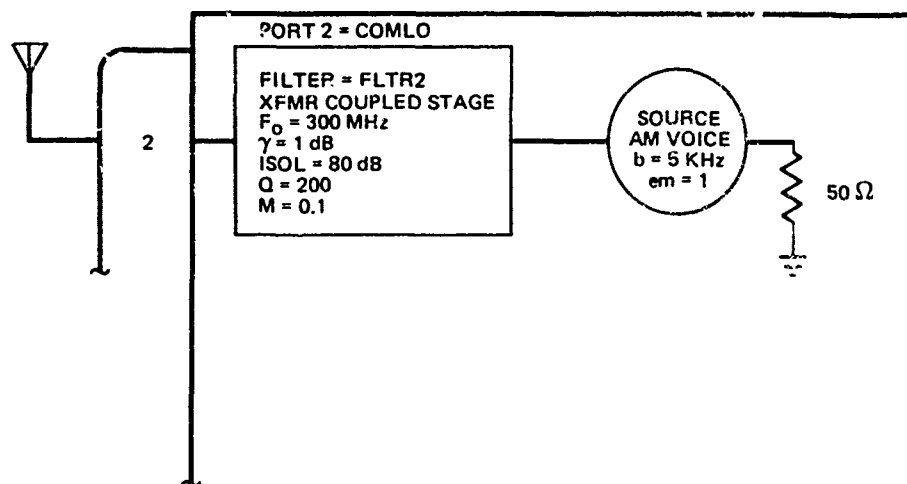
FIGURE 28
DETAIL OF PORT "COMLO"

CHAN BW =
50 KHz

100 WATTS

TYPICAL TUNED
FREQ SPECTRUM

50 dB

100 dB

ENVELOPE

MIL-STD-461A
CEO6
LEVEL

2nd
HARMONIC

3rd
HARMONIC

14 KHz

CARRIER
TUNING
RANGE

18 GHz

225 MHz   399.9 MHz
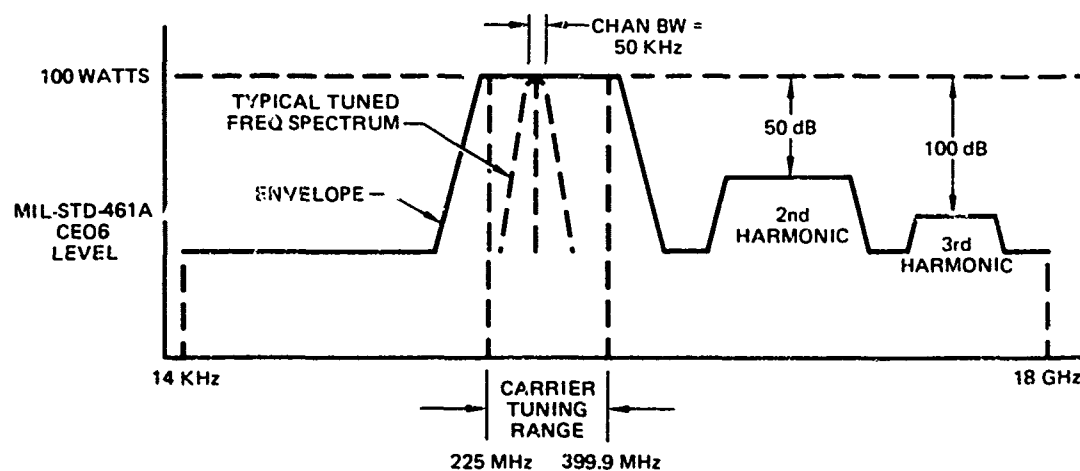
FIGURE 29
EMISSION SPECTRUM OF PORT "COMLO"

GP73 1075

113
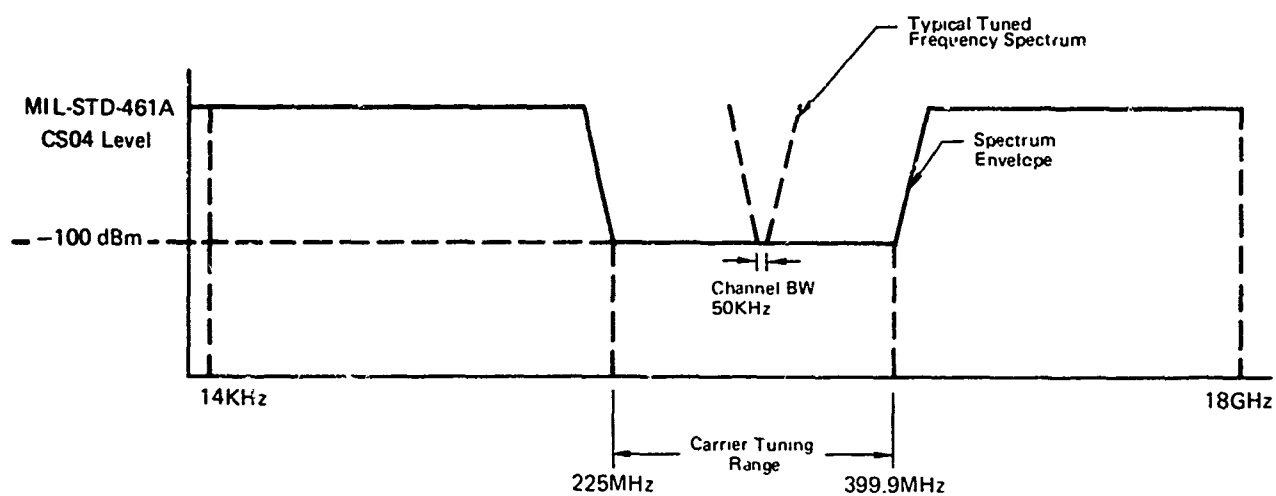
FIGURE 30
SUSCEPTIBILITY SPECTRUM OF PORT "COMLO"

CP13 1075 37

114

Since case leakage is not an intentional port, it has no required outputs or susceptibilities. For the particular port in question, the susceptibility and narrowband emission spectra are the MIL-STD-461A limits. The broadband emission spectrum, however, is user defined and is shown in Figure 27.

As an example of an intentional port, consider port "COMLO" connected to the lower communications antenna. A schematic of this port is shown in Figure 28, and its spectra are shown in Figures 29 and 30. This port is an input and output for voice AM signals whose carrier ranges from 225 to 399.9 MHz. As shown in Figures 29 and 30, the total frequency range of interest is 14 KHz to 18 GHz. The frequency range of the required outputs and responses is 225 to 399.9 MHz. In this required range, IEMCAP will compute the emission spectra. Since this is a tunable port, the envelope formed by tuning the carrier over its range will be used. The second and third harmonics are 50 and 100 dB, respectively, below the carrier as shown. All other spurious outputs are limited to MIL-STD-461A levels. The susceptibility threshold spectrum is similarly computed.

5.2 IEMCAP RUN FOR MINI-SYSTEM

With the system to be analyzed defined, the data is written in the IEMCAP input format and punched into cards for use by the program. These cards are read, decoded, and listed by IDIPR. Any diagnostics generated are included in this listing.

The input card listing of the data described above is reproduced in Figure 31. (Note that some of the key words are abreviated by their first two characters; e.g., "BU" for "BUNDLE"). The task specified on the EXEC card is for an EMC survey, and the job status is new (no old ISF). There are no diagnostics, so the program continues into initial processing.

After the spectra, the working files, and the new ISF are generated, a report of all data processed and spectra generated is printed. Sample outputs from the report for the mini-system run are reproduced in Figures 32 through 36.

With the data successfully processed by IDIPR, the TART section of IEMCAP is run. Samples from the TART output for a mini-system survey run are reproduced in Figures 37 through 39. The analysis output is given for the first two receptor ports in UHFCO, described in the previous section. Note that no intrasystem EMI was found for the equipment case (Figure 38). The EMI summaries from the emitter ports coupled to COMLO are reproduced in Figure 39.

INPUT CARDS

```
                    {REMARK= FILE ID=CCOT4M CORRECTED BASELINE SYSTEM.   REVISED 9-4-73
CONTROL  {           EXEC=CEAR,NEW,SURVEY
                     OU=NO
                    {SYSTEM=AIR,0,0,0,-06,-100.
SYSTEM   {           WNGRT=55,12,225,456
                     WGTIP=230,16,435,490
                     FUSLGE=165.,56.5,19.8,25.,12.,FLAT
ENVIRON- {          EFO= 1E3,100E3,1E6,100E6,1E9,4E9
MENTAL   {           OE=30,30,40,40,30,30
   FIELD {           IE=-20,-20,5,5,-20,-20
                    {APER=NSEWH  ,0,0,86,35,50,NOW
APERTURE {           APER=TOPCP,0,77.2,332.5,30,10,NOW
                    {ANT=COMTA,DIPOLE,VE,(.20)
                     ANT=CMADF,LOOP,HZ,(.25)
                     ANT=TPSP,DIPOLE,VE,(.08)
ANTENNA  {           ANT=PODHR,HORN,HZ,(.10,7.5,30,30,-5,90,-20)
                     ANT=PDOMN,DIPCLE,VE,(.05)
                    {ANT=ALTM,HORN,HZ,(.05,7.5,25,60,-4,110,-30)
                    {FILTER=FLTR1,SGTUN,1,(300.E6,1.E3,-1,-80)
                     FILTER=FLTR2,TRCOUP,1,(300.E6,-1,-80,200,.1)
                     FILTER=FLTR3,BUTTER,5,(1.075E9,.1E6,-1,-80)
FILTERS  {           FILTER=FLTR4,LOWPAS,4,(1.5E9,-1,-80)
                     FILTER=FLTR5,HIPAS,4,(.95E6,-1,-80)
                     FILTER=FLTR6,BPASS,6,(.9E6,4.05E6,-1,-80)
                    {FILTER=FLTR7,BRJCT,10,(4.01E5,8.E6,-1,-80)
   WIRE  {          {WRTBL=SPC22,UN,1,30,1,6,2.8
  TABLE  {           WRTBL=SPCS2,SH,1,30,1,6,2.8,42,8,6.6,463
         {           WRTBL=SPCCC,DS,1,30,1,6,2.8,42.9,6.6,463,7,6.7
                     SUBSYS=CNI
                        EQPT=UHFCO,M461,ADJUST,AFCTR,NONE,21.5,23,180
                     COMMENT=UHF COMM
                        FREQ=30,18.E9,1,35
                    {PORT=CASE,0,0
EQUIPMENT {           SOURCE=CASE, 30,MILSPC,SP(100.,27.5,100.E3,27.5,25.E6,52.6,100.E6,
   CASE   {25,              1.E9,-24.6)
                    {   RCEPT=CASE,10.,MILSPC,MILSPC
                    {PORT=CCMLO,ANT,(COMTA,0,0,0,0,86,NOW),50,0,0,0,0       ,FLTR2
PORT COMLO {          SOURCE=RF, 30.,225E6,399.9E6,100.,50.E3,AM(VOICE,5.E3,1),(-50,-100)
                    {   RCEPT=RF, 30.,225E6,399.9E6,-100 ,50.E3,AM(VOICE,5.E3,0),1.E6
                     PORT=COMUP,ANT,(COMTA,0,0,0,138,625,NOW),50,0,0,0,0   ,FLTR1
                        SOURCE=RF, 30.,225E6,399.9E6,100.,50.E3,AM(VOICE,5.E3,1),(-50,-100)
                        RCEPT=RF, 30.,225E6,399.9E6,-100,50.E3,AM(VOICE,5.E3,0),1.E6
                     PORT=ADFIN,ANT,(CMADF ,0,0,0,0,129,NOW),50,0,0,0,0         ,0
                        RCEPT=RF, 30.,225E6,399.9E6,-100,50.E3,AM(VOICE,5.E3,0),1.E6
                     PORT=PWRSP,WIRE,(BNDL1,B1W1,A1,GND,NONE,EX),-5,0,0,0,0       ,0
                        SOURCE=POWER,30,115,400,2,1,M461A
                        RCEPT=POWER,30,115,400,2,1,M461A
                     PORT=AIDOT,WIRE,(BNDL2,B2W2,A2,GND,NONE,NOTEX),50,0,0,0,0    ,0
                        SOURCE=SIGNAL, 30.,20.E3,4.E6,RECTPL( 20.E3,1.E-6),10,VLTS,4.E6
                     PORT=PYCON,WIRE,(BNDL2,B2W1,A2,GND,GND,EX),50,0,0,0,0,0
                        SOURCE=SIGNAL,30,20.E3,5.E6,RECTPL (1.E3,.2E-3),10,VLTS,4.E6
                        RCEPT=SIGNAL,30,20.E-12,5.E6,RECTPL(1.E3,.2E-3),10,VLTS,4.E6
                     COMMENT=TACAN
                        EQPT=TACAN,M61810,ADJUST,CNIBY,NOT,-3,15,175
                        FREQ=30,18.E9,1,35
                        FQTBL=800.E6,962.E6,1025E6,1130.E6,1213.E6,1280.E6,1380E6
                        PORT=CASE,0,0
                           SOURCE=CASE,30,MILSPC,MILSPC
                           RCEPT=CASE, 30,MILSPC,MILSPC
                        PORT=TACRF,ANT,(COMTA,0,0,0,80,374,NOW),50,0,0,0,0      ,FLTR3
                           SOURCE=RF, 30,1025.E6,1130E6,1500,572E3,RADAR(RECTPL,30,2.5E-6),(-60,-80)
```

FIGURE 31
DATA INPUT FOR MINI-SYSTEM

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```
      RCEPT=RF,30,962E6,1213E6,-100,500E3,RADAR(RECTPL,30,2.5E-6),100E6
    POPT=POWER,WIRE,(BNDL1,B1W2,B1,GND,GND,NOTEX),.5,0,0,0,0     ,0
      SOURCE= POWER,30,115,400,0,3,M461A
      RCEPT= POWER,30,115,400,0,3,M461A
  EQPT=IFF,M461,ADJUST,CNTRY,NOT,5,7,175
   FREQ=30,18.E9,1,35
   FQTBL=1030.E6,1090F6
    PORT=CASE,0,0
      SOURCE=CASE,30,MIL,MIL
      RCEPT=CASE,30,MIL,MIL
     PORT=IFFRF,ANT,(TRSP,0,0,0,80,224,NOW),50,0,0,0,0     ,FLTR4
       SOURCE=RF,30,1090E6,1090E6,1000,5E6,RADAR,(TPZD,2200,.45E-5,
             .1E-6,.1E-6),(-60,-90)
       RCEPT=RF,30,1030E6,1030E6,-70,7E6,RADAR(TPZD,2200,.45E-6,.1E-6,
          .1E-6),0
    PORT=POWER,WIRE,(BNDL1,B1W2,C1,GND,NONE,NOTEX),.5,0,0,0,0     ,0
      SOURCE=POWER,30,115,400,3,3,M461A
      RCEPT= POWER,30,115,400,0,3,M461A
SUBSYS=IMGPD
COMMENT=IN-BOARD PYLON
  EQPT=INPYL,M461A,ADJUST,STA6,NON ,81.5,-20,300
   FREQ=30,18.E9,1,35
   FQTBL=1E6,4E6,5E6
   PORT=CASE,0,0
      SOURCE=CASE,30,MILSPC,MILSPC
      RCEPT= CASE,30,MILSPC,MILSPC
    PORT=IPFX,ANT,(PODHR,100,0,81.5,-20,210,BOT),73,0,0,0,0,FLTR5
       SOURCE=RF,30,1E6,4E6,15000,3E6,SPECT(-.5E6,-18.2,0.,71.8,
             .5E6,-18.2),(-60.,-80.)
    PORT=IPAX,ANT,(PODHR,100,180,81.5,-20,340,BOT),73,0,0,0,0,FLTR5
       SOURCE=RF,30,1E6,4E6,15000,3E6,SPECT(-.5E6,-18.2 ,0.,71.8 ,
             .5E6,-18.2),(-60.,-80.)
     PORT=IPOP,ANT,(PODHN,0,0,81.5,-20,270,BOT),100,0,0,0,0     ,0
        RCEPT=RF,30,1E6,4E6,-90,3F6,SPECT(-.5E6,-18.2,
             0,71.8,.5E6,-18.2),0
    POPT=EEDIN,WIRE,(BNDL2,B2W1,P2,GND,GS,EX),1,0,0,0,0     ,0
      RCEPT=EED,30,1,1,(30,1.0, 1.E10,1,0)
    PORT=AIDIN,WIRE,(BNDL2,B2W2,P2,GND,GND,NOTEX),100E3,0,0,0,0,0
      RCEPT=SIGNAL,30,1E3,5.E6,RECTPL(20.E3,1.E-6),10,VLTS,4.E6
    PORT=PWRSP,WIRE,(BNDL1,B1W1,C1,GND,NONE,EX),.5,0,0,0,0     ,0
      SOURCE=POWER,30,115,400,2,1,M461A
      RCEPT=POWER,30,115,400,2,1,M461A
COMMENT=OUTBOARD PYLON
  EQPT=ORPYL,M461A,ADJUST,STA9,NON ,134.5,-20,350
   FREQ=30,18.E9,1,35
   FQTBL=1E6,4E6,5E6
   PORT=CASE,0,0
      SOURCE=CASE,30,MILSPC,MILSPC
      RCEPT= CASE,30,MILSPC,MILSPC
    PORT=ORFX,ANT,(PODHR,100,0,134.5,-20,300,90T),73,0,0,0,0,FLTR6
       SOURCE=RF,30,1E6,4E6,15000,3F6,SPECT(-.5E6,-18.2,0.,71.8,
             .5E6,-18.2),(-60.,-80.)
    PORT=ORAX,ANT,(PODHR,100,180,134.5,-20,370,BOT),73,0,0,0,0,FLTR6
       SOURCE=RF,30,1E6,4E6,15000,3E6,SPECT(-.5E6,-18.2,0.,71.8,
             .5E6,-18.2),(-60.,-80.)
     PORT=OROP,ANT,(PODHN,0,0,134.5,-20,340,BOT),100,0,0,0,0     ,0
        RCEPT=RF,30,1E6,4E6,-90,3F6,SPECT(-.5E6,-18.2,
             0,71.8,.5E6,-18.2),0
COMMENT=CENTER LINE STATION
  EQPT=CENTL,M461A,ADJUST,STA5,NON ,0,-20,325
   FREQ=30,18.E9,1,35
   FQTBL=1E6,4E6,5E6
   PORT=CASE,0,0
      SOURCE=CASE,30,MILSPC,MILSPC
```

FIGURE 31 (Continued)
DATA INPUT FOR MINI-SYSTEM

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```
            RCEPT= CASE,30,MILSEC,MILSEC
        PORT=CLFX, ANT,(PODHR,100,0,0,-20,280,NOW),73,0,0,0,0 ,FLTR7
            SOURCE=RF,30,1E6,4E6.15000,3E6,SPECT(-.5E6,-18.2,0.,71.8,
                .5E6,-18.2),(-60.,-80.)
        PORT=CLAX, ANT,(PODHR,100,180,0,-20,350,NOW),73,0,0,0,0,FLTR7
            SOURCE=RF,30,1E6,4E6,15000,3E6,SPECT(-.5E6,-18.2,0.,71.8,
                .5E6,-18.2),(-60.,-90.)
          PORT=IPOP,ANT,(PODMN,0,0,0,-20,310,NOW),100,0,0,0,0          ,U
            RCEPT=RF,30,1E6,4E6,-90,3E6,SPECT(-.5E6,-18.2,
                0,71.8,.5E6,-18.2),0
SUBSYS=RDALT
  EQPT=PTUNT,M461,ADJUST,CNIBY,NOT,0,9,175
    FREQ=30,18E9,1,35
    FOTBL=4200E6,4300E6,4400E6
      PORT=CASE,0,0
        SOURCE=CASE,30,MIL,MIL
        RCEPT=CASE,30,MIL,MIL
      PORT=PFOUT,ANT,(ALTM,0,180,42,0,212,NOW),50,0,0,0,0          ,0
        SOURCE=RF,30,4200E6,4400E6,100,8E5,RADAP(TPZD,10E3,.1E-6,.01E-6,
                .01E-6),(-40,-40,-40)
      PORT=RFIN,ANT,(ALTM,0,180,-42,0,212,NOW),50,0,0,0          ,0,0
        RCEPT=RF,30,4200E6,4300E6,-90,6E6,RADAP(TPZD,10E3,.1E-6,.01E-6,
                .01E-6),0
SUBSYS=DISP
  EQPT=DTSP,M461,ADJUST,AFTCP,NOT,21.5,18,180
    FREQ=30,18.E9,1,35
      PORT=CASE,0,0
        SOURCE=CASE,30,MIL,MIL
        RCEPT=CASE,30,MIL,MIL
      PORT=DSPIN,WIRE,(BNDL2,B2W2,D2,GND,GND,EX),50,0,0,0,0,0
        RCEPT=SIGNAL,30,1E3,5.E5,PFCTPL(20.E3,1.E-6),10,VLTS,4.E6
BU=BNDL1
  BPTS=A1,5,65,100,B1,0,80.,370.4,C1,-5,90,400
    BSEG=A1,B1,270.9,4,COMP1,TOPCP,
      B1,C1,    32.0,4,COMP1,0
        WIRE=B1W1,SPC22,A1,B1,C1
        WIRE=B1W2,SPCS2,B1,C1
BUNDLE=BNDL2
  BPTS=A2,0,75,115,B2,-81.5,-20,270,C2,5,90,400,D2,21.5,18,180
    BSEG=A2,C2,119.2,4,COMP1,NSEWH,
      B2,C2,191.0,4,COMP2,0,
      D2,C2,220,4,COMP1,0
        WIRE=B2W1,SPCCC,A2,C2,32
        WIRE=B2W2,SPCS2,B2,C2,D2,A2
EODATA
```

<div align="center">
FIGURE 31 (Continued)

INPUT FOR MINI-SYSTEM
</div>

FILE ID=CCOT6M COPRECTED BASELINE SYSTEM, REVISED 9-4-73

NEW ISF FILE
****

SYSTEM TYPE   AIRCRAFT

ADJUSTMENT SAFETY MARGIN FOR SGR   -6.0 DB
EMI MARGIN MINIMUM PRINTOUT LIMIT   -100.0 DB

FUSELAGE DATA

CON NOSE LIMIT FS(FSN)   165.0
FUSELAGE RADIUS   56.5
CORE RADIUS (RHOC)   18.8
CENTROID WL (WLC)   25.0
BOTTOM WL (WLBOT)   12.0
CYL. BOTTOM OPTION USED)   FL

NO. APERTURES   2
NO. ANTENNAS   6
NO. FILTERS   7
NO. ENTRIES IN WIRE TABLE   3

APERTURE DATA ID		WATER LINE	BUTT-LINE	FUSELAGE SY.		WIDTH	LFNGTH	WING-LOC
				FS FWD	FS AFT			
1	NSEWH	0.0	0.0	46.0	456.0	35.0	50.0	NO
2	TOPCB	0.0	77.2	332.5	490.0	30.0	10.0	NO

WING POINTS	RL	WL	FS FWD	FS AFT
ROOT	55.0	12.0	225.0	
TIP	230.0	16.0	435.0	

ENVIRONMENTAL FIELD LEVELS

FREQUENCY	OUTSIDE L.	INSIDE L.		FREQUENCY	OUTSIDE L.	INSIDE L.
1	.1000E+04	.3000E+02	-.2000E+12	4	.1000E+09	.4000E+02	.5000E+01
2	.1000E+06	.3000E+02	-.2000E+02	5	.1000E+10	.3000E+02	-.2000E+02
3	.1000E+07	.4000E+02	.5000E+01	6	.4000E+10	.3000E+02	-.2000E+02

FIGURE 32
SYSTEM DATA
IDIPR OUTPUT FOR MINI-SYSTEM

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ANTENNAS

	ID	MODEL CODE	POLARIZ. CODE	LENGTH (M)	MAX DIA (M)	MAX GAIN (DB)	3-DB HALF-BEAMWIDTH VERT (DEG)	AZIM	MAJOR GAIN (DB) AZIM	SIDE LOBE GAIN(DB)	ANG(DEG)	BACK LOBE GAIN(DB)	FL (MHZ)
1	COMTA	DI	VE	.2	.25								
2	CMADF	LC	HZ	.1									
3	TRSP	DI	VE	.1	.10	7.50	30.00	30.00		-5.00	30.00	-20.00	
4	PDOHR	HC	HZ		.05	7.50	25.00	50.00		-4.00	110.00	-30.00	
5	PDOHN	DT	VE										
6	ALTH	MC	HZ										

FILTERS

	ID	TYPE	NUMBER OF STAGES	FO (MHZ)	P (MHZ)	GAMMA (DB)	ISOL (DB)	Q	M	RIP FACTOR	FU (MHZ)	FL (MHZ)
1	FLTR1	SG	1	.3000E+09	.1000E+07	-.1000E+01	-.8000E+02					
2	FLTR2	TR	1	.3000E+09		-.1000E+01	-.8000E+02					
3	FLTR3	BU	5	.1075E+10	.1000E+06	-.1000E+01	-.8000E+02	.2000E+03	.1000E+00			
4	FLTR4	LC	4			-.1000E+01	-.5000E+02					
5	FLTR5	HT	4			-.1000E+01	-.8000E+02				.1500E+10	
6	FLTR6	BP	6			-.1000E+01	-.8000E+02				.4050E+07	.9500E+06
7	FLTR7	BR	10			-.1000E+01	-.3000E+02				.8000E+07	.4010E+07

WIRE CHARACTERISTICS TABLE

	TYPE DESIGNATION	SH/UNSH CODE	NO.WIRES TWISTED	COND.O.D.	CONDUCT. THICKNESS	INSULAT. THICKNESS	DIALECT CONST.	SHIELD 1 INTERNAL DIAMETER	INTERNAL THICK.	JACKET THICK.	SH-COND. CAP.	SHIELD 2 DIAM.	THICK.
1	SPC22	UN	1	30.0	1.0	6.0	2.8	42.0	8.0	6.6	463.0		
2	SPCS2	SH	1	30.0	1.0	6.0	2.8	42.0	8.0	6.6	463.0	7.0	
3	SPCCC	NS	1	30.0	1.0	6.0	2.8						6.7

FIGURE 32 (Continued)
SYSTEM DATA
IDIPR OUTPUT FOR MINI-SYSTEM

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SUBSYSTEM
ID= CNI

EQUIPMENT NO. IS   1

ID	COMPARTMENT NO.	WATER LINE	BUTT LINE	FUSELAGE STATION	SPEC	FIXAJ	M4	AD	NO	CLASS
AFCTD		21.5	27.0	180.0						

LO. FREQ= .3000000E+02   HI. FREQ. = .1800000E+11   NO. FREQ. PER OCTAVE= 1   MAX. NO. OF FREQS=. 35

LO. FREQ= .3000000E+02

PORTS

PORT ID	CONNECT. CODE	SOURC	FILTER ID	TERM. RESIST.	CAPACIT.	INDUCTION SUBPARAMETERS		SPECT. OTSP SO	RC
CASE	CASE	BOTH							
COMLO	ANT ATD=COHTA THETA= 0.	BOTH	FLTR2	.5000000E+02 PHI= 0.	0.	LOC COORD= 0.	0.	0. 0.	
FOKUP	ANT AID=COHTA THETA= 0.	BOTH	FLTR1	.5000000E+02 PHI= 0.	0.	LOC COORD= 0.	0. .13503E+03,	0. .86000E+02	WGLOC=NO
HDFIN	ANT AID=CFADF THETA= 0.	RCPT		.5000000E+02 PHI= 0.	0.	LOC COORD= 0.	0.	0. .62500E+03,	WGLOC=NO
PWRSD	WIRE	BOTH		.5000000E+00 WIRE ID=BNDL1	0. PT ID=B1	BNDL ID=BNDL1	0. .12900E+03	0. REFWIRE=GND	WGLOC=NO
AIOOT	WIRE	FWTQ		.5000000E+02 WIRE ID=BNDL2	0. PT ID=A2	BNDL ID=BNDL2	0.	0. REFWIRE=GND SH. TERM=NO	0. APEXP=EX
PVFON	WIRE	BOTH		.5000000E+02 WIRE ID=BNDL2	0. PT ID=A2	BNCL ID=BNDL2	0.	0. REFWIRE=GND SH. TERM=GN	0. APEXP=NO

FIGURE 33
SUBSYSTEM DATA
SAMPLE IDIPR OUTPUT FOR MINI-SYSTEM

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EMITTERS AND RECEPTORS

INDX PORT ID		SR CODE	ADJLIM	NSPEC	BRSPEC			
1	CASE	SPEC	.3000000E+02	MIL	SPEC			
	99=	.1000000E+03	.2760000E+02	.1000000E+06	.2750000E+02	.2500000E+0R	.1000000E+09	.2500000E+02
		.1000000E+10	-.2460000E+02					
1	CASE	RCPT	.1000000E+02	MIL	MIL			

INDX PORT ID		SR CODE	ADJLIM	LOW F.	HI F.	MAX P/S/A UNIT IF A	BWC	MOD/SIG	PTYP/SIG	FIF
2	COMLO SRCE RF	.30000E+02	.22500E+09	.39990E+09	.10000E+03	.50000E+05	AM	VO		
	B= .5000000E+04	EM= .100000E+01								
	HARM= -.5000000E+02	-.1000000E+03								
2	COMLO RCPT RF	.30000E+02	.22500E+09	.39990E+09	-.10000E+03	.50000E+05	AM	VO		.10000E+07
	9= .5000000E+04	EM= 0.								
3	COMUP SRCE RF	.30000E+02	.22500E+09	.39990E+09	.10000E+03	.50000E+05	AM	VO		
	R= .5000000E+04	EM= .100000UE+01								
	HARM.= -.5000000E+02	-.1000000E+03								
3	COMUP RCPT RF	.30000E+02	.22500E+09	.39990E+09	-.10000E+03	.50000E+05	AM	VO		.10000E+07
	6= .5000000E+04	EM= 0.								
4	ADFIN RCPT RF	.30000E+02	.22500E+09	.39990E+09	-.10000E+03	.50000E+05	AM	VO		.10000E+07
	B= .5000000E+04	EM= 0.								

INDX PORT ID		SR CODE	ADJLIM	VOLTAGE	FREQ	HI.HARM.	NO.PHASES.	RS CODE
4	PWRSP SRCE	PWR	.3000000E+02	.1150000E+03	.4000000E+03	2	1	M4
5	PWRSP RCPT	PWR	.3000000E+02	.1150000E+03	.4000000E+03	2	1	M4

FIGURE 33 (Continued)
SUBSYSTEM DATA
SAMPLE IDIPR OUTPUT FOR MINI-SYSTEM

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INDX	PORT ID		SR CODE	ADJLTM	LOW F.	HI F	MAX P/S/A	UNIT IF A	BWC	MOD/SIG	PTYP/SIG	FIF
6	AIDOT SPRE	SIG		.30000E+02	.20000E+05	.40000E+07	.10000E+02	VL	.40000F+07	RF		
	PA= .200000E+05			T= .100000UE-05								
7	PVCON SRCE	SIG		.30000F+02	.20000E+05	.50000E+07	.10000F+02	VL	.40000E+07	RE		
	RB= .100000E+04			T= .200000F-03								
7	PVCON RCRV	SIG		.30000E+02	.20000E-10	.50000E+07	.10000E+02	VL	.4CC0GE+07	PF		
	DG= .100000E+04			T= .2000000E-03								

FIGURE 33 (Continued)
SUBSYSTEM DATA
SAMPLE IDIPR OUTPUT FOR MINI-SYSTEM

123

SUBS = CNI   EQPT = UHFCO

FLO2= .3000E+02 FHI2= ._800E+11 NFQO2= 1 NFQU2= 0 NFRQ= 31

F R E Q U E N C Y   T A B L E

I	FROTBL	I	FROTBL	I	FRQTBL
1	.3000E+02	12	.6144E+05	23	.1258E+09
2	.6000E+02	13	.1229E+06	24	.2517E+09
3	.1200E+03	14	.2459E+06	25	.5033E+09
4	.2400E+03	15	.4915E+06	26	.1007E+10
5	.4800E+03	16	.9830E+06	27	.2013E+10
6	.9600E+03	17	.1965E+07	28	.4027E+10
7	.1920E+04	18	.3932E+07	29	.8053E+10
8	.3840E+04	19	.7864E+07	30	.1611E+11
9	.7680E+04	20	.1573E+08	31	.3221E+11
10	.1536E+05	21	.3146E+08		
11	.3072E+05	22	.6291E+08		

EMTR FREQ INDEX TABLE

ISR	PRT TYPE	IFMIN	FMIN	IFMAX	FMAX
1	RF	9	.7680E+04	31	.3221E+11
2	PWR	1	.3000E+02	22	.6291E+08
3	SIG	1	.3000E+02	22	.6291E+08
4	CTRL	1	.3000E+02	22	.6291E+08
5	EED	1	.3000E+02	1	.3000E+02
6	CASE	1	.3000E+02	30	.1611E+11

RCPT FREQ INDEX TABLE

ISR	PRT TYPE	IFMIN	FMIN	IFMAX	FMAX
1	RF	9	.7680E+04	31	.3221E+11
2	PWR	1	.3000E+02	25	.5033E+09
3	SIG	1	.3000E+02	30	.1611E+11
4	CTRL	1	.3000E+02	30	.1611E+11
5	EED	1	.3000E+02	30	.1611E+11
6	CASE	1	.3000E+02	30	.1611E+11

FIGURE 34
FREQUENCY TABLE
IDIPR OUTPUT FOR MINI-SYSTEM

INITIAL PORT SPECTRA

SUBS = CNI   EQPT 1 = UHFCO EQPT 1 = CASE

IFRQ	FREQUENCY	EMITTER				RECEPTOR	
		NB SPECT	NB LIMIT	BB SPECT	BB LIMIT	SPECT	LIMIT
1	.3000E+02	-1000.0	-1030.0	-1000.0	-1030.0	1000.0	1010.0
2	.6000E+02	-1000.0	-1030.0	-1000.0	-1030.0	1000.0	1010.0
3	.1200E+03	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
4	.2400E+03	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
5	.4800E+03	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
6	.9600E+03	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
7	.1920E+04	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
8	.3840E+04	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
9	.7680E+04	-1000.0	-1030.0	27.5	-2.5	1000.0	1010.0
10	.1536E+05	35.0	5.0	27.5	-2.5	140.0	150.0
11	.3072E+05	34.0	4.0	27.5	-2.5	140.0	150.0
12	.6144E+05	32.6	2.6	27.5	-2.5	140.0	150.0
13	.1229E+06	31.2	1.2	30.3	.3	140.0	150.0
14	.2458E+06	29.8	-.2	33.4	3.4	140.0	150.0
15	.4915E+06	28.4	-1.6	35.6	6.6	140.0	150.0
16	.9830E+06	27.1	-2.9	39.7	9.7	140.0	150.0
17	.1966E+07	25.7	-4.3	42.9	12.9	140.0	150.0
18	.3952E+07	24.3	-5.7	45.0	16.0	140.0	150.0
19	.7864E+07	22.9	-7.1	49.2	19.2	140.0	150.0
20	.1573E+08	21.5	-8.5	52.3	22.3	140.0	150.0
21	.3146E+08	24.2	-5.8	52.6	22.6	134.0	144.0
22	.6291E+08	28.9	-1.1	40.0	10.0	134.0	144.0
23	.1258E+09	33.5	3.5	25.2	-3.8	134.0	144.0
24	.2517E+09	38.1	8.1	11.3	-18.7	134.0	144.0
25	.5033E+09	42.8	12.8	-3.6	-33.6	134.0	144.0
26	.1007E+10	47.4	17.4	-18.5	-48.5	134.0	144.0
27	.2813E+10	52.0	22.0	-1000.0	-1030.0	134.0	144.0
28	.4027E+10	56.6	26.6	-1000.0	-1030.0	134.0	144.0
29	.8053E+10	60.0	30.0	-1000.0	-1030.0	134.0	144.0
30	.1611E+11	-1000.0	-1030.0	-1000.0	-1030.0	146.0	156.0

INITIAL PORT SPECTRA

SUBS = CNI   EQPT 1 = UHFCO PORT 2 = COMLO

IFRQ	FREQUENCY	EMITTER				RECEPTOR	
		NB SPECT	NB LIMIT	BB SPECT	BB LIMIT	SPECT	LIMIT
9	.7680E+04	43.0	13.0	-1000.0	-1030.0	103.0	133.0
10	.1536E+05	43.0	13.0	-1000.0	-1030.0	103.0	133.0
11	.3072E+05	43.0	13.0	-1000.0	-1030.0	103.0	133.0
12	.6144E+05	43.0	13.0	-1000.0	-1030.0	103.0	133.0
13	.1229E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
14	.2458E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
15	.4915E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
16	.9830E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
17	.1966E+07	43.0	13.0	-1000.0	-1030.0	103.0	133.0
18	.3932E+07	43.0	13.0	-1000.0	-1030.0	103.0	133.0
19	.7864E+07	43.0	13.0	-1000.0	-1030.0	103.0	133.0
20	.1573E+08	43.0	13.0	-1000.0	-1030.0	103.0	133.0
21	.3146E+08	43.0	13.0	-1000.0	-1030.0	103.0	133.0
22	.6291E+08	43.0	13.0	-1000.0	-1030.0	103.0	133.0
23	.1258E+09	43.0	13.0	-1000.0	-1030.0	103.0	133.0
24	.2517E+09	123.0	93.0	143.5	113.5	-27.0	3.0
25	.5033E+09	123.0	93.0	143.5	116.5	-27.0	3.0
26	.1007E+10	73.0	43.0	98.5	68.5	103.0	133.0
27	.2013E+10	43.0	13.0	-1000.0	-1030.0	103.0	133.0
28	.4027E+10	43.0	13.0	-1000.0	-1030.0	103.0	133.0
29	.8053E+10	43.0	13.0	-1000.0	-1030.0	103.0	133.0
30	.1511E+11	43.0	13.0	-1000.0	-1030.0	103.0	133.0
31	.3221E+11	43.0	13.0	-1000.0	-1030.0	103.0	133.0

FIGURE 35
INITIAL PORT SPECTRA
IDIPR OUTPUT FOR MINI-SYSTEM

I N I T I A L   P O R T   S P E C T R A

SUBS = CNI   EQPT 1 = UHFCO PORT 3 = COMUP

IFRQ	FREQUENCY	+----------------EMITTER----------------+				+----RECEPTOR----+	
		NB SPECT	NB LIMIT	BB SPECT	BB LIMIT	SPECT	LIMIT
9	.7690E+04	43.0	13.0	-1000.0	-1030.0	103.0	133.0
10	.1536E+05	43.0	13.0	-1003.0	-1030.0	103.0	133.0
11	.3072E+05	43.0	13.0	-1000.0	-1030.0	103.0	133.0
12	.6144E+05	43.0	13.0	-1000.0	-1030.0	103.0	133.0
13	.1229E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
14	.2458E+06	43.0	13.0	-1003.0	-1030.0	103.0	133.0
15	.4915E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
16	.9838E+06	43.0	13.0	-1000.0	-1030.0	103.0	133.0
17	.1966E+07	43.0	13.0	-1000.0	-1030.0	103.0	133.0
18	.3932E+07	43.0	13.0	-1000.0	-1030.0	103.0	133.0
19	.7864E+07	43.0	13.0	-1000.0	-1030.0	103.0	133.0
20	.1573E+08	43.0	13.0	-1000.0	-1030.0	103.0	133.0
21	.3146E+08	43.0	13.0	-1000.0	-1030.0	103.0	133.0
22	.6291E+08	43.0	13.0	-1000.0	-1030.0	103.3	133.0
23	.1258E+09	43.0	13.0	-1000.0	-1030.0	103.0	133.0
24	.2517E+09	123.0	93.0	148.5	118.5	-27.0	3.0
25	.5033E+09	123.0	93.0	148.5	118.5	-27.0	3.0
26	.1007E+10	73.0	43.0	98.5	68.5	103.0	133.0
27	.2013E+10	43.0	13.0	-1000.0	-1030.0	103.0	133.0
28	.4027E+10	43.0	13.0	-1000.0	-1030.0	103.0	133.0
29	.8053E+10	43.0	13.0	-1000.0	-1030.0	103.0	133.0
30	.1611E+11	43.0	13.0	-1000.0	-1030.0	103.0	133.0
31	.3221E+11	43.0	13.0	-1000.0	-1030.0	103.0	133.0

I N I T I A L   P O R T   S P E C T R A

SUBS = CNI   EQPT 1 = UHFCO PORT 4 = ADFIN

IFRQ	FREQUENCY	+----------------EMITTER----------------+				+----RECEPTOR----+	
		NB SPECT	NB LIMIT	BB SPECT	BB LIMIT	SPECT	LIMIT
9	.7698E+04	0.0	0.0	0.0	0.0	103.0	133.0
10	.1536E+05	0.0	0.0	0.0	0.0	103.0	133.0
11	.3072E+05	0.0	0.0	0.0	0.0	103.0	133.0
12	.6144E+05	0.0	0.0	0.0	0.0	103.0	133.0
13	.1229E+06	0.0	0.0	0.0	0.0	103.0	133.0
14	.2458E+06	0.0	0.0	0.0	0.0	103.0	133.0
15	.4915E+06	0.0	0.0	0.0	0.0	103.0	133.0
16	.9838E+06	0.0	0.0	0.0	0.0	103.0	133.0
17	.1966E+07	0.0	0.0	0.0	0.0	103.0	133.0
18	.3932E+07	0.0	0.0	0.0	0.0	103.0	133.0
19	.7864E+07	0.0	0.0	0.0	0.0	103.0	133.0
20	.1573E+08	0.0	0.0	0.0	0.0	103.0	133.0
21	.3146E+08	0.0	0.0	0.0	0.0	103.0	133.0
22	.6291E+08	0.0	0.0	0.0	0.0	103.0	133.0
23	.1258E+09	0.0	0.0	0.0	0.0	103.0	133.0
24	.2517E+09	0.0	0.0	0.0	0.0	-27.0	3.0
25	.5033E+09	0.0	0.0	0.0	0.0	-27.0	3.0
26	.1007E+10	0.0	0.0	0.0	0.0	103.0	133.0
27	.2013E+10	0.0	0.0	0.0	0.0	103.0	133.0
28	.4027E+10	0.0	0.0	0.0	0.0	103.0	133.0
29	.8053E+10	0.0	0.0	0.0	0.0	103.0	133.0
30	.1611E+11	0.0	0.0	0.0	0.0	103.0	133.0
31	.3221E+11	0.0	0.0	0.0	0.0	103.0	133.0

FIGURE 35 (Continued)
INITIAL PORT SPECTRA
IDIPR OUTPUT FOR MINI-SYSTEM

INITIAL PORT SPECTRA

SUBS = CNI   EQPT 1 = UHFCO PORT 5 = PWRSP

IFRQ	FREQUENCY	EMITTER				RECEPTOR	
		NB SPECT	NB LIMIT	BB SPECT	BB LIMIT	SPECT	LIMIT
1	.3000E+02	130.0	100.0	132.0	102.0	135.6	165.6
2	.6000E+02	130.0	100.0	132.0	102.0	135.6	165.6
3	.1200E+03	130.0	100.0	132.0	102.0	135.6	165.6
4	.2400E+03	130.0	100.0	132.0	102.0	135.6	165.6
5	.4800E+03	130.0	100.0	132.0	102.0	135.5	165.5
6	.9600E+03	130.0	100.0	132.0	102.0	135.4	165.4
7	.1920E+04	130.0	100.0	132.0	102.0	134.4	164.4
8	.3840E+04	122.1	92.1	132.0	102.0	133.4	163.4
9	.7680E+04	107.0	77.0	132.0	102.0	132.5	162.5
10	.1536E+05	92.0	62.0	132.0	102.0	131.5	161.5
11	.3072E+05	78.2	48.2	129.5	99.5	130.5	160.5
12	.6144E+05	69.1	39.1	117.1	87.1	129.6	159.6
13	.1229E+06	60.1	30.1	104.8	74.8	128.6	158.6
14	.2458E+06	51.1	21.1	92.5	62.5	127.7	157.7
15	.4915E+06	42.0	12.0	80.1	50.1	127.2	157.2
16	.9830E+06	33.0	3.0	67.8	37.8	127.2	157.2
17	.1966E+07	24.0	-6.0	55.4	25.4	127.2	157.2
18	.3932E+07	20.0	-10.0	50.0	20.0	127.2	157.2
19	.7864E+07	20.0	-10.0	50.0	20.0	127.2	157.2
20	.1573E+08	20.0	-10.0	50.0	20.0	127.2	157.2
21	.3146E+08	20.0	-10.0	50.0	20.0	127.2	157.2
22	.6291E+08	20.0	-10.0	50.0	24.0	127.2	157.2
23	.1258E+09	0.0	0.0	0.0	0.0	127.2	157.2
24	.2517E+09	0.0	0.0	0.0	0.0	127.2	157.2
25	.5033E+09	0.0	0.0	0.0	0.0	127.2	157.2

INITIAL PORT SPECTRA

SUBS = CNI   EQPT 1 = UHFCO PORT 6 = AIDOT

IFRQ	FREQUENCY	EMITTER				RECEPTOR	
		NB SPECT	NB LIMIT	BB SPECT	BB LIMIT	SPECT	LIMIT
1	.3000E+02	130.0	100.0	132.0	102.0	0.0	0.0
2	.6000E+02	130.0	100.0	132.0	102.0	0.0	0.0
3	.1200E+03	130.0	100.0	132.0	102.0	0.0	0.0
4	.2400E+03	130.0	100.0	132.0	102.0	0.0	0.0
5	.4800E+03	130.0	100.0	132.0	102.0	0.0	0.0
6	.9600E+03	130.0	100.0	132.0	102.0	0.0	0.0
7	.1920E+04	130.0	100.0	132.0	102.0	0.0	0.0
8	.3840E+04	122.1	92.1	132.0	102.0	0.0	0.0
9	.7680E+04	107.0	77.0	132.0	102.0	0.0	0.0
10	.1536E+05	-1034.0	-1064.0	92.0	62.0	0.0	0.0
11	.3072E+05	-1034.0	-1064.0	92.0	62.0	0.0	0.0
12	.6144E+05	-1034.0	-1064.0	92.0	62.0	0.0	0.0
13	.1229E+06	-1034.0	-1064.0	92.0	62.0	0.0	0.0
14	.2458E+06	-1034.0	-1064.0	92.0	62.0	0.0	0.0
15	.4915E+06	-1034.0	-1064.0	90.8	60.8	0.0	0.0
16	.9830E+06	-1034.0	-1064.0	84.7	54.7	0.0	0.0
17	.1966E+07	-1034.0	-1064.0	78.7	48.7	0.0	0.0
18	.3932E+07	-1034.0	-1064.0	72.7	42.7	0.0	0.0
19	.7864E+07	20.0	-10.0	50.0	20.0	0.0	0.0
20	.1573E+08	20.0	-10.0	50.0	20.0	0.0	0.0
21	.3146E+08	20.0	-10.0	50.0	20.0	0.0	0.0
22	.6291E+08	20.0	-10.0	50.0	20.0	0.0	0.0

FIGURE 35 (Continued)
INITIAL PORT SPECTRA
IDIPR OUTPUT FOR MINI-SYSTEM

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INITIAL PORT SPECTRA

SUBS = CNI   EQPT 1 = UHFCO PORT 7 = PYCON

IFRQ	FREQUENCY	EMITTER				RECEPTOR	
		NS SPECT	NS LIMIT	9B SPECT	9B LIMIT	SPECT	LIMIT
1	.3066E+02	130.0	100.0	132.0	102.0	86.0	116.0
2	.6988E+02	130.0	100.0	132.0	102.0	86.0	116.0
3	.1208E+03	130.0	130.0	132.0	102.0	86.0	116.0
4	.2488E+03	130.0	100.0	132.0	102.0	86.0	116.0
5	.4808E+03	130.0	100.8	132.0	102.0	86.0	116.0
6	.9608E+03	130.0	100.0	132.0	102.0	86.0	116.0
7	.1928E+04	130.0	100.0	132.0	102.0	86.0	116.0
8	.3848E+04	122.1	92.1	132.8	102.0	86.0	116.0
9	.7688E+04	107.0	77.0	132.0	102.0	86.0	116.0
10	.1538E+05	-1034.0	-1064.0	107.9	77.9	86.0	116.0
11	.3072E+05	-1034.0	-1064.0	101.5	71.8	86.0	116.0
12	.6144E+05	-1034.0	-1064.0	95.8	65.8	86.0	116.0
13	.1229E+06	-1034.0	-1064.0	89.8	59.8	86.0	116.0
14	.2458E+06	-1034.0	-1064.0	83.8	53.8	86.0	116.0
15	.4915E+06	-1034.0	-1064.0	77.8	47.8	86.0	116.0
16	.9830E+06	-1034.0	-1064.0	71.7	41.7	86.0	116.0
17	.1966E+07	-1034.0	-1064.0	65.7	35.7	86.0	116.0
18	.3932E+07	-1034.0	-1064.0	59.7	29.7	86.0	116.0
19	.7864E+07	20.0	-10.0	50.0	20.0	103.0	133.0
20	.1573E+08	20.0	-10.0	50.0	20.0	103.0	133.0
21	.3146E+08	20.0	-10.0	50.0	20.0	103.0	133.0
22	.6291E+08	20.0	-10.0	50.0	20.0	103.0	133.0
23	.1258E+09	0.0	0.0	0.0	0.0	103.0	133.0
24	.2517E+09	0.0	0.0	0.0	0.0	103.0	133.0
25	.5033E+09	0.0	0.0	0.0	0.0	103.0	133.0
26	.1007E+10	0.0	0.0	0.0	0.0	103.0	133.0
27	.2013E+10	0.0	0.0	0.0	0.0	103.0	133.0
28	.4027E+10	0.0	0.0	0.0	0.0	103.0	133.0
29	.8053E+10	0.0	0.0	0.0	0.0	103.0	133.0
30	.1611E+11	0.0	0.0	0.0	0.0	103.0	133.0

FIGURE 35 (Continued)
INITIAL PORT SPECTRA
IDIPR OUTPUT FOR MINI-SYSTEM

BUNDLE   1

   ID:BNDL1

   NODE POINTS:
NODE   X   Y   7
A1   5.0   65.0   100.0
B1   0.0   80.0   370.4
C1   -5.0   90.0   400.0

   BUNDLE SEGMENTS:
POINT 1   POINT 2   CMPT   APERTURE   LENGTH   HEIGHT

A1   B1   COMP1   TOPCP   270.9   4.0
B1   C1   COMP1   32.0   4.0

WIRES:

ID   W.C.T. TYPE   POINTS:

B1W1   SPC22   A1   B1   C1
B1W2   SPCS2   B1   C1

FIGURE 36
WIRE BUNDLE DATA
IDIPR OUTPUT FOR MINI-SYSTEM

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IEMCAP TASK ANALYSIS ROUTINE

TITLE = SGR TEST DATA MINI-SYSTEM
REMARK = @FILE ID=CCOT4M CORRECTED BASELINE SYSTEM. REVISED 9-4-73

ANALYSIS TASK.......................BASELINE EMC SURVEY
SYSTEM TYPE.........................AIRCRAFT
EMI MARGIN MINIMUM PRINTOUT LIMIT..... -100C.C DB

FIGURE 37
TART OUTPUT FOR MINI-SYSTEM
TITLE PAGE

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ENVIRONMENTAL FIFLD INTERFERENCE SUMMARY

FREQUENCY (HERTZ)	EMI MARGIN	RECEPTOR SUSC LEV	RCPT RECEIVED SIG-DB	RECEIVED SIG-NUM
3.00000E+01	-2000.0	1000.0	-1000.0	0.
6.00000E+01	-2000.0	1000.0	-1000.0	0.
1.20000E+02	-2000.0	1000.0	-1000.0	0.
2.40000E+02	-2000.0	1000.0	-1000.0	0.
4.80000E+02	-2000.0	1000.0	-1000.0	0.
9.60000E+02	-200.0	1000.0	-200.0	1.0000E+10
1.92000E+03	-800.0	1000.0	200.0	1.0000E+10
3.84000E+03	-800.0	1000.0	200.0	1.0000E+10
7.68000E+03	-800.0	1000.0	200.7	1.0000E+10
1.53600E+04	63.0	1.0.0	200.0	1.0000E+10
3.07200E+04	60.0	1.0.0	200.0	1.0000E+10
6.14400E+04	60.0	1.0.0	200.0	1.0000E+10
1.22880E+05	73.3	1.0.0	213.3	-.612E+10
2.45760E+05	88.3	1.0.0	22.3	2.00.25E+11
4.91520E+05	107.0	1.0.0	2-3.4	1.760E+12
9.83040E+05	116.0	1.0.0	253.0	3.1623E+12
1.96608E+06	116.0	1.0.0	253.0	3.1623E+12
3.93216E+06	110.0	1.0.0	250.0	3.1623E+12
7.86432E+06	110.0	1.0.0	250.0	3.1623E+12
3.14573E+07	115.0	137.0	2.0.0	3.1623E+12
6.29146E+07	116.0	134.0	2.0.0	3.1623E+12
1.25829E+08	116.0	134.0	2.0.0	3.1623E+12
2.51658E+08	102.2	134.0	23.2	1.5135E+11
5.03316E+08	87.2	134.0	221.2	1.1422E+11
1.00663E+09	72.1	134.0	205.1	2.1192E+10
2.01327E+09	65.0	134.0	200.1	1.0000E+10
4.02653E+09	64.0	134.0	200.0	1.0000E+10
8.05306E+09	-1134.0	134.0	-1000.0	0.
1.61061E+10	-1140.0	1.6.0	-1000.0	0.

FIGURE 38
TART OUTPUT FOR MINI-SYSTEM
UHFCO EQUIPMENT CASE

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = CNI   EQPT 2 = TACAN   PORT 2 = TACRF   (UNCHANGED)

RCPT -- SUBS = CNI   EQPT 1 = UHFCO   PORT 1 = COMLO   (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL		NARROWBAND			BROADBAND		
				EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
1.19669E+04	EMTR	-175.8	103.0 I	-273.8	-170.8	1.0	-278.3	-175.2	26.0 I	-24.4
1.536v0E+05	RCPT	-176.6	103.0	-273.8	-170.8	6.0 I	-277.2	-174.2	26.0 I	-23.4
2.53030E+04	EMTR	-172.9	103.0 I	-273.9	-170.9	6.0	-275.1	-172.1	26.0	-21.2
7.07200E+04	RCPT	-175.9	103.0	-273.9	-170.9	6.0 I	-274.3	-171.2	26.0 I	-20.4
5.34913E+04	EMTR	-177.0	103.0 I	-274.0	-171.0	6.0	-276.1	-173.7	26.0	-22.7
6.14400E+04	RCPT	-177.0	103.0	-274.0	-171.0	6.0 I	-276.1	-173.1	26.0 I	-22.1
1.13805E+05	EMTR	-177.1	103.0 I	-274.1	-171.1	0.0	-273.6	-170.6	26.0	-19.5
1.22800E+05	RCPT	-177.2	103.0	-274.2	-171.1	6.0 I	-273.3	-170.2	26.0 I	-19.1
2.39068E+05	EMTR	-177.4	103.0 I	-274.3	-171.3	6.0	-270.5	-167.5	26.0	-16.2
2.45760E+05	RCPT	-177.5	103.0	-274.4	-171.3	6.0 I	-270.4	-167.4	26.0 I	-16.1
4.91520E+05	RCPT	-177.5	103.0	-274.6	-171.5	6.0	-267.7	-164.7	26.0	-13.1
5.05404E+05	EMTR	-177.5	103.0 I	-274.6	-171.5	6.0	-267.5	-164.6	26.0 I	-13.0
9.83040E+05	RCPT	-173.0	103.0	-275.0	-172.0	6.0 I	-265.1	-162.1	26.0 I	-10.1
1.06845E+06	EMTR	-178.0	103.0	-275.3	-172.3	6.0	-266.3	-163.3	26.0	-11.3
1.96608E+06	RCPT	-178.2	103.0	-275.5	-172.5	6.0 I	-264.1	-161.1	26.0	-8.6
2.25677E+06	EMTR	-178.5	103.0 I	-275.5	-172.5	6.0 I	-263.6	-160.6	26.0	-8.0
3.93216E+06	RCPT	-183.8	103.0	-277.8	-174.8	6.0 I	-263.4	-160.4	26.0	-5.6
4.77517E+06	EMTR	-192.7	103.0	-279.0	-176.0	6.0	-264.4	-161.4	26.0	-4.8
7.86432E+06	RCPT	-159.5	103.0	-264.5	-181.5	6.0 I	-267.1	-164.1	26.0	-2.6
1.00900E+07	EMTR	-159.9	103.0	-266.3	-183.3	6.0	-269.3	-166.8	26.0	-3.0
1.57266E+07	RCPT	-139.2	103.0	-291.2	-188.2	6.0 I	-272.2	-169.2	26.0	-1.0
2.13414E+07	EMTR	-195.9	103.0 I	-253.9	-190.9	6.0 I	-273.6	-170.6	26.0	0.3
3.14573E+07	RCPT	-230.3	103.0	-297.3	-194.3	6.0 I	-272.3	-172.3	26.0 I	2.0
4.51169E+07	EMTR	-202.9	103.0	-299.2	-196.2	6.0	-275.3	-172.9	26.0	3.5
6.29146E+07	RCPT	-205.0	103.0	-301.0	-198.0	6.0 I	-276.0	-173.0	25.0 I	5.0
9.53796E+07	EMTR	-229.5	103.0	-297.5	-194.5	6.0	-273.3	-167.8	26.0	6.8
1.25829E+08	RCPT	-191.2	103.0	-248.2	-185.2	6.0 I	-263.2	-160.2	26.0 I	5.0
2.01636E+08	EMTR	-178.0	14.0 IR	-165.0	-173.0	6.0 I	-181.0	-176.5	26.0 I	-13.5
2.51658E+08	RCPT	-163.3	-27.0 R	-1.0	-17.3	6.0 I	-143.3	-170.3	26.0 I	-13.0
4.26274E+08	EMTR	-133.3	-27.0 IR	-160.3	-18.3	6.0 I	-153.3	-180.3	26.0 I	-13.0
5.03316E+08	RCPT	-159.7	-27.0 R	-143.7	-190.0	6.0 I	-150.7	-163.7	26.0 I	-13.0
8.00000E+08	EMTR	-247.7	59.9	-301.5	-241.7	6.0	-268.0	-208.7	26.0	13.5
9.01166E+08	EMTR	-263.3	62.3 I	-339.0	-257.3	6.0 I	-305.1	-223.8	26.0	13.5
9.62000E+08	EMTR	-256.5	64.5 I	-333.3	-250.6	6.0 I	-318.5	-225.0	26.0	13.8
1.00663E+09	RCPT	-142.3	103.0	-8.3	-8.3	95.1 IR	-212.5	-109.8	77.1 IR	-4.0
1.02500E+09	EMTR	-18.4	103.0	-155.5	-52.	13.6 R	-195.3	-93.3	97.5 R	-4.0
1.13000E+09	EMTR	-159.0	103.0	-1.7	-51.3	134.0 R	-199.2	-96.2	97.0 R	-4.0
1.21300E+09	EMTR	-27.0	103.0	-357.7	-264.0	6.0 I			26.0	13.0
1.24000E+09	EMTR	-272.0	103.0	-369.0	-265.3	6.0 I			26.0	13.5
1.35000E+09	EMTR	-270.0	103.0	-357.0	-261.0	6.0 I				
1.90512E+09	EMTR	-263.0	103.0	-311.3	-208.3	7.9	-335.7	-232.7	37.5	12.3
2.01327E+09	RCPT	-243.4	103.0	-314.4	-211.4	73.3 I	-338.6	-235.6	36.0 I	13.0

FIGURE 39

TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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EMTR -- SUBS = CNI   EQPT 2 = TACAN PORT 2 = TACOF (UNCHANGED)

RCPT -- SUBS = CNI   EQPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT   (CONTD)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
-.026C3E+39	RCPT	-30.0	103.0	-312.1	-252.1	2.8 I	-372.3	-273.3	17.5 I	15.1
4.027C3E+39	EMTR	-30.0 I	103.0 I	-312.1	-252.1	2.8 I	-372.7	-273.3	17.5	16.1
8.0J3J6E+09	RCPT	-332.0	103.0	-422.0	-322.0	0.0 I				
6.2I403E+09	EMTR	-33.0	103.0 I	-431.5	-72.0	0.0				
1.0101E+10	RCPT	-30.1	103.0	-6.0.1	-35.1	0.0 I				
1.30CCCE+10	EMTR	-30.0	103.0 I	-43.0	-55.0	0.0				

INTEGRATED EMI MARGIN = -432.0

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

EMTR -- SUBS = CNI   EQPT 3 = IFF   PORT 2 = IFFRF (UNCHANGED)
RCPT -- SUBS = CNI   EQPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN PEID RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	----NARROWBAND---- EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	----BROADBAND---- EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
8.63032E+03	EMTR	-85.9	103.0 I	-1.6.9	-43.9	43.0				
1.53600E+04	RCPT	-87.0	103.0 I	-147.0	-44.0	43.0 I				
1.66071E+04	EMTR	-87.0	103.0 I	-147.0	-44.0	43.0				
3.07208E+04	RCPT	-87.1	103.0 I	-147.1	-44.1	43.0 I				
3.12328E+04	EMTR	-87.1	103.0 I	-147.1	-44.1	43.0 I				
5.87392E+04	EMTR	-87.3	103.0 I	-147.3	-44.2	43.0				
6.14400E+04	RCPT	-87.3	103.0 I	-147.3	-44.3	43.0 I				
1.10470E+05	EMTR	-87.4	103.0 I	-147.4	-44.4	43.0 I				
1.22880E+05	RCPT	-87.5	103.0 I	-147.5	-44.5	43.0 I				
2.07760E+05	EMTR	-87.7	103.0 I	-147.7	-44.7	43.0 I				
2.45760E+05	RCPT	-87.6	103.0 I	-147.6	-44.7	43.0 I				
3.90733E+05	EMTR	-88.0	103.0 I	-148.0	-45.0	43.0 I				
4.91520E+05	RCPT	-88.2	103.0 I	-148.2	-45.1	43.0 I				
7.34847E+05	EMTR	-88.5	103.0 I	-148.5	-45.5	43.0 I				
9.83040E+05	RCPT	-88.7	103.0 I	-148.7	-45.7	43.0 I				
1.36202E+06	EMTR	-89.0	103.0 I	-149.0	-46.0	43.0 I				
1.96608E+06	RCPT	-89.4	103.0 I	-149.4	-46.4	43.0 I				
2.59915E+06	EMTR	-89.8	103.0 I	-149.8	-46.8	43.0 I				
3.93216E+06	RCPT	-90.4	103.0 I	-150.4	-47.4	43.0 I				
4.86820E+06	EMTR	-90.7	103.0 I	-150.7	-47.7	43.0 I				
7.86432E+06	RCPT	-93.2	103.0 I	-153.2	-50.1	43.0 I				
9.19316E+06	EMTR	-94.8	103.0 I	-154.8	-51.8	43.0 I				
1.57286E+07	RCPT	-100.5	103.0 I	-160.5	-57.5	43.0 I				
1.72895E+07	EMTR	-101.5	103.0 I	-161.5	-58.5	43.0 I				
3.14573E+07	RCPT	-107.4	103.0 I	-167.4	-64.4	43.0 I				
3.25162E+07	EMTR	-107.9	103.0 I	-167.9	-64.9	43.0 I				
6.11530E+17	RCPT	-112.5	103.0 I	-172.6	-69.5	43.0 I				
6.29146E+07	RCPT	-112.3	103.0 I	-172.3	-69.3	43.0 I				
1.15010E+08	EMTR	-102.4	103.0 I	-168.4	-65.3	43.0 I				
1.25829E+08	RCPT	-100.8	103.0 I	-160.8	-57.5	43.0 I				
2.16238E+08	EMTR	-91.1	1.0 IR	-0.1	-42.7	43.0 I				
2.51658E+08	RCPT	-9.4	-27.0 IR	-24.8	-51.8	43.0 I				
4.06709E+08	EMTR	-10.2	-27.0 IR	-35.2	-62.2	43.0 IR				
5.03316E+08	RCPT	-113.1	-27.0 R	-0.1	-67.1	133.1 R	-182.3	-62.2	99.5 R	3.5
7.65044E+08	EMTR	-157.0	21.5 I	-168.3	-116.5	43.0				
1.00663E+09	RCPT	-17.8	103.0 I	-238.3	-135.5	43.0				
1.03000E+09	EMTR	-183.5	103.0 I	-243.5	-140.	43.0				
1.43861E+09	EMTR	-15.2	103.0 I	-156.2	-72.2	43.0				
2.01327E+09	RCPT	-193.3	103.0 I	-0.1	-156.9	43.0 I				
2.70596E+09	EMTR	-26.1	103.0	-219.1	-146.1	75.0 I	-742.2	-539.2	-47.1	13.0
4.02653E+09	RCPT	-22.5	103.0	-255.8	-152.8	73.0 I	-272.0	-172.0	39.5	14.3
	RCPT	-22.1	103.0	-302.9	-195.9	5.1 I				

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = CNI   ECPT   3 = IFF   PORT   2 = IFFRF   (UNCHANGED)

RCPT -- SUBS = CNI   F2PT   1 = UHFCO   PORT   2 = COMLO   (UNCHANGED)

(CONTD)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
5.08907E+09	EMTR	-272.3	103.0 I	-332.3	-226.3	+3.0				
6.0330E+09	RCPT	-30.9	103.0	-30.3	-255.3	+3.0 I				
9.5739E+09	EMTR	-321.2	103.0 I	-301.2	-270.1	+3.0				
1.61061E+10	RCPT	-354.9	103.0	-421.3	-314.3	+3.5 I				
1.8000E+10	EMTR	-171.0	103.0 I	-431.0	-323.0	+3.0				

INTEGRATED EMI MARGIN = 0.0

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

FMTR -- SUBS = IMGPD EMPT 4 = INPYL PORT 2 = IPFX (UNCHANGED)

R PT -- SUBS = CNI EOPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND			BROADBAND			
				EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER LEVEL	BDWDTH FACTOR
1.06076E+04	EMTR	-165.9	103.0 I	-226.8	-123.8	42.1				
1.53600E+04	RCPT	-155.9	103.0 I	-226.8	-123.8	42.1 I				
2.03602E+04	EMTR	-165.9	103.0 I	-226.8	-123.8	42.1 I				
3.07200E+04	RCPT	-165.9	103.0 I	-226.8	-123.6	42.1				
3.90795E+04	EMTR	-165.9	103.0 I	-226.8	-123.6	42.1 I				
6.14400E+04	RCPT	-155.9	103.0 I	-226.8	-123.6	42.1 I				
7.50093E+04	EMTR	-161.0	107.0 I	-221.9	-116.9	42.1 I				
1.22880E+05	RCPT	-142.9	103.0 I	-203.3	-100.8	42.1 I				
1.39973E+05	EMTR	-138.3	103.0 I	-199.2	-96.2	42.1 I				
2.45760E+05	RCPT	-115.6	113.0 I	-179.7	-76.7	42.1 I				
2.76342E+05	EMTR	-112.7	103.0 I	-176.5	-73.5	42.1 I				
4.91520E+05	RCPT	-94.7	103.0 I							
5.30413E+05	EMTR	-93.4	103.0 I							
9.83040E+05	RCPT	-86.6	103.0 I	-77.5	25.2	112.3 IR	-278.7	-175.7	-21.0 IR	-60.0
1.00000E+06	EMTR	-85.9	103.0 I	-6.7	56.3	143.1 R	-148.3	-45.0	108.4 R	-60.0
1.01808E+06	EMTR	-85.0	103.0 I	-46.7	56.3	143.1 R	-107.5	-4.6	145.2 R	-60.0
1.95410E+06	EMTR	-86.7	103.0 I	-46.6	56.4	143.1 R	-106.7	-3.7	143.2 R	-60.0
1.96608E+06	RCPT	-86.0	103.0 I	-46.3	56.4	143.1 IR	-106.5	-3.6	143.2 R	-60.0
3.75070E+06	EMTR	-83.0	103.0 I	-46.5	56.2	143.1 R	-106.5	-3.5	143.2 IR	-60.0
3.93216E+06	RCPT	-86.0	103.0 I	-46.3	56.7	143.1 IR	-106.3	-3.3	143.2 R	-60.0
4.00000E+06	EMTR	-85.5	103.0 I	-46.3	56.6	143.1 R	-106.4	-3.4	143.2 IR	-60.0
5.00000E+06	EMTR	-55.5	103.0 I	-167.2	-4.2	83.1	-196.3	-93.3	53.2 R	-60.0
7.19910E+06	RCPT	-67.3	103.0 I	-110.5	-7.1	86.4 I	-110.1	-7.1	83.2	-3.0
7.86432E+06	EMTR	-53.0	103.0 I	-132.0	-29.0	63.1	-113.1	-10.1	80.5 I	-2.6
1.38180E+07	RCPT	-92.2	103.0 I	-137.0	-34.0	63.1	-133.6	-30.6	63.2	-1.6
1.57266E+07	EMTR	-93.0	103.0 I	-157.0	-54.0	59.0	-345.1	-242.0	-146.0 I	-1.0
2.62263E+07	RCPT	-93.2	103.0 I	-157.7	-54.7	42.1 I				
3.14573E+07	EMTR	-76.0	103.0 I	-1.9	-56.0	42.1				
5.09069E+07	RCPT	-93.1	103.0 I	-16.3	-5.3	42.1 I				
6.29146E+07	EMTR	-37.5	103.0 I	-14.1	-51.1	42.1				
9.77109E+07	RCPT	-93.2	103.0 I	-1.5	-36.3	42.1 I				
1.25829E+08	EMTR	-91.0	103.0 I	-0.5	-22.3	42.1 I				
1.87547E+08	RCPT	-6.5	28.2 IR	2.1	-24.9	42.1 I				
2.51658E+08	EMTR	-67.0	-27.0 IR	-1.9	-26.9	42.1				
3.59478E+08	RCPT	-70.1	-27.0 R	-3.3	-30.5	42.1 I				
5.03316E+08	EMTR	-73.0	32.4	-97.7	-6.3	42.1 I				
6.99942E+08	RCPT	-107.0	103.0 I	-19.3	-8.4	42.1 I				
1.03663E+09	EMTR	-123.0	103.0 I	-196.3	-93.3	42.1 I				
1.32620E+09	RCPT	-13.0	103.0 I	-199.9	-99.9	42.1 I				
2.01327E+09	EMTR	-1.1	103.0 I	-251.1	-96.9	42.1 I				
2.54551E+09	EMTR	-1.1	103.0 I	-251.1	-96.9	42.1 I				
4.02653E+09	RCPT	-1.0	103.0 I	-255.7	-102.9	42.1 I				

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

'AMPLIF SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMUPC   ECPT   + = INPUL PORT   2 = IPFX   (UNCHANGED)

RCPT -- SUBS = UNI   EQPT   1 = UHFCO PORT   2 = COMLO   (UNCHANGED)

(CONTD)

PATH = ANT TO ANT

NOTE - R = IN FEQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (MHZ)	FREQ BAND	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND		BROADBAND	
				EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BNDWDTH FACTOR
4.95355+09	EMTR	-145.7	103.7 I	-207.5	-10.5	+2.1			
8.023EE+09	RCPT	-171.1	103.7	-211.3	-10.5	+2.1 I			
9.377925+09	EMTR	-172.4	103.0 I	-213.3	-210.1	+2.1			
1.61001E+10	RCPT	-10.01	103.0	-213.0	-11.3	+2.1 I			
1.80000E+10	EMTR	-15.01	1.3.0 I	-213.9	-11.3	+2.1			

INTEGRATED EMI MARGIN = -27.3

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCC COMLO

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPD   EQPT 4 = INPYL   PORT 3 = IPAX   (UNCHANGED)

RCPT -- SUBS = CNI   EQPT 1 = UHFCO   PORT 2 = COMLO   (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
1.06076E+04	EMTR	-185.0	103.0 I	-246.9	-143.8	42.1				
1.53600E+04	RCPT	-186.0	103.0 I	-246.9	-143.5	42.1				
2.03602E+04	EMTR	-185.0	103.0 I	-246.8	-143.8	42.1				
3.07200E+04	RCPT	-186.0	103.0 I	-245.8	-143.8	42.1 I				
3.90795E+04	EMTR	-185.0	103.0 I	-246.8	-143.8	42.1				
6.14430E+04	RCPT	-186.0	103.0 I	-246.8	-143.6	42.1 I				
7.50093E+04	EMTR	-181.0	103.0 I	-241.9	-136.9	42.1 I				
1.22800E+05	RCPT	-152.9	103.0 I	-223.8	-120.8	42.1 I				
1.43973E+05	EMTR	-158.4	103.0 I	-219.3	-116.2	42.1 I				
2.45760E+05	RCPT	-135.6	103.0 I	-199.7	-96.7	42.1 I				
2.76342E+05	EMTR	-135.7	103.0 I	-196.5	-93.5	42.1				
4.91520E+05	RCPT	-114.7	103.0 I	-97.6	5.4	112.3 IR	-298.8	-195.8	-21.0 IR	-60.0
5.30413E+05	EMTR	-113.4	103.0 I	-66.8	36.2	143.1 R	-168.0	-65.0	108.4 R	-60.0
9.63040E+05	RCPT	-106.9	103.0 I	-66.7	36.3	143.1 I	-127.6	-24.6	142.2 IR	-60.0
1.00000E+06	EMTR	-106.9	103.0 I	-66.5	36.4	143.1 R	-126.7	-23.7	143.2 R	-60.0
1.01808E+06	EMTR	-105.9	103.0 I	-66.7	36.3	143.1 R	-126.7	-23.7	143.2 R	-60.0
1.95410E+06	EMTR	-105.7	103.0 I	-66.5	36.4	143.1 R	-125.6	-23.6	143.2 R	-60.0
1.96608E+06	RCPT	-106.7	103.0 I	-66.6	36.4	143.1 IR	-126.6	-23.6	143.2 IR	-60.0
3.75070E+06	EMTR	-107.2	103.0 I	-67.1	35.9	143.1 R	-127.1	-24.1	143.2 R	-60.0
3.93216E+06	RCPT	-107.5	103.0 I	-67.4	35.5	143.1 IR	-127.3	-24.3	143.2 IR	-68.0
4.00000E+06	EMTR	-107.6	103.0 I	-67.5	35.4	143.1 R	-127.6	-24.6	143.2 R	-60.0
5.00000E+06	EMTR	-105.5	103.0 I	-132.3	-29.2	83.1	-219.4	-116.4	53.2 R	-60.0
7.19910E+06	RCPT	-112.4	103.0 I	-135.6	-32.5	80.0 I	-135.2	-32.2	83.2 I	-3.0
7.86432E+06	EMTR	-113.0	103.0 I	-117.1	-54.1	93.1	-138.2	-35.2	80.5 I	-2.6
1.38180E+07	EMTR	-117.2	103.0 I	-182.1	-79.1	59.0 I	-158.7	-55.7	63.2 I	-1.6
1.57286E+07	RCPT	-113.1	103.0 I	-182.1	-79.1	42.1 I	-378.1	-267.1	-148.0 I	-1.0
2.65223E+07	EMTR	-121.2	103.0 I	-182.5	-79.8	42.1 I				
3.14573E+07	RCPT	-121.9	103.0 I	-184.1	-81.1	42.1 I				
5.09069E+07	EMTR	-123.2	103.0 I	-183.0	-80.1	42.1 I				
6.29146E+07	RCPT	-122.0	103.0 I	-179.1	-72.1	42.1 I				
9.77109E+07	EMTR	-114.3	103.0 I	-166.4	-63.4	42.1 I				
1.25829E+08	RCPT	-109.5	103.0 I	-75.5	-47.5	42.1 I				
1.87547E+08	EMTR	-61.1	28.2 IR	-23.0	-49.5	42.1 I				
2.51656E+08	RCPT	-92.1	-27.0 IR	-26.1	-53.1	42.1				
3.59978E+08	EMTR	-9.2	-27.0 IR	-29.0	-56.0	42.1 I				
5.03316E+08	RCPT	-93.1	32.4 R	-122.3	-30.4	42.1 I				
6.90942E+08	EMTR	-132.5	103.0 I	-214.3	-111.3	42.1 I				
1.00663E+09	RCPT	-15.4	103.0 I	-221.4	-116.3	42.1 I				
1.32620E+09	EMTR	-15.3	103.0 I	-225.0	-122.0	42.1 I				
2.01327E+09	RCPT	-16.1	103.0 I	-225.0	-122.0	42.1 I				
2.54551E+09	EMTR	-16.1	103.0 I	-227.0	-122.0	42.1 I				
4.02653E+09	RCPT	-17.1	103.0 I	-231.0	-125.0	42.1 I				

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

BASELINE SYSTEM EMTR-RCPT AIR INTERFERENCE

EMTR -- SUBS = IMSPL EQPT 4 = INPYL PORT 3 = IPAX (UNCHANGED)

RCPT -- SUBS = CNI EQPI 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT   (CONTD)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	EMI MARGIN	NARROWBAND RECEIVED SIGNAL	EMITTER SPCT LEVEL	BROADBAND RECEIVED SIGNAL	EMITTER SPCT LEVEL	BANDWDTH FACTOR
9.98565E+09	EMTR	-17/1.3	103.0 I	-232.7	-123.3	42.1			
8.05366E+09	RCPT	-17.1	103.0	-237.3	-134.3	42.1 I			
9.37792E+09	EMTR	-17.3	103.0 I	-238.3	-13.3	42.1			
1.61061F+10	RCPT	-1.2.2	103.3	-2.3.3	-145.3	42.1 I			
1.800JCF+10	EMTR	-153.1	103.3 I	-2.4.3	-141.3	42.1			

INTEGRATED EMI MARGIN = 12.2

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPD   EQPT 5 = OBPYL   PORT 2 = OBFX   (UNCHANGED)

RCPT -- SUBS = CNI   EQPT 1 = UHFCO   PORT 2 = COMLO   (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
					NARROWBAND			BROADBAND		
1.06076E+04	EMTR	-87.3	103.0 I	-148.2	-45.2	42.1				
1.53600E+04	RCPT	-87.3	103.0 I	-148.2	-42.2	42.1				
2.03602E+04	EMTR	-87.3	103.0 I	-148.2	-45.2	42.1				
3.07200E+04	RCPT	-87.3	103.0 I	-148.2	-45.2	42.1 I				
3.90795E+04	EMTR	-87.3	103.0 I	-148.2	-45.2	42.1 I				
6.14400E+04	RCPT	-87.3	103.0 I	-148.2	-45.2	42.1 I				
7.50093E+04	EMTR	-87.3	103.0 I	-148.2	-45.2	42.1				
1.22800E+05	RCPT	-87.3	103.0 I	-148.2	-45.2	42.1 I				
1.43973E+05	EMTR	-87.3	103.0 I	-148.2	-45.2	42.1				
2.45760E+05	RCPT	-87.3	103.0 I	-148.2	-45.2	42.1 I				
2.76342E+05	EMTR	-6.3	103.0 I	-148.2	-45.2	42.1				
4.91520E+05	RCPT	-87.3	103.0 I	-77.9	22.1	112.3 IR	-271.3	-168.3	-21.0 IR	-60.0
5.30413E+05	EMTR	-87.3	103.0 I	-47.1	51.9	143.1 R	-161.8	-38.8	108.4 R	-60.0
9.83040E+05	RCPT	-87.2	103.0 I	-7.1	55.3	143.1 R	-176.3	-5.0	142.2 IR	-60.0
1.00000E+06	EMTR	-87.2	103.0 I	-7.1	56.0	143.1 R	-107.1	-4.1	143.2 R	-60.0
1.95410E+06	EMTR	-87.1	103.0 I	-7.0	56.0	143.1 R	-107.0	-4.0	143.2 R	-60.0
1.96600E+06	RCPT	-87.1	103.0 I	-7.0	56.0	143.1 R	-106.3	-3.9	143.2 IR	-60.5
3.75070E+06	EMTR	-87.1	103.0 I	-7.0	56.3	143.1 R	-106.3	-3.9	143.2 R	-60.0
3.93216E+05	RCPT	-87.1	103.0 I	-7.2	55.8	143.1 IR	-107.2	-4.2	143.2 IR	-60.0
4.00000E+06	EMTR	-87.5	103.0 I	-7.2	55.1	143.1 R	-107.5	-4.5	143.2 R	-60.0
5.00000E+06	EMTR	-89.4	103.0 I	-112.1	-9.1	83.1	-193.3	-95.3	53.2	-60.0
7.19910E+06	EMTR	-92.2	103.0 I	-115.5	-12.5	86.4	-115.1	-12.1	83.2	-3.0
7.86432E+06	RCPT	-9?.1	103.0 I	-137.0	-34.0	63.1 I	-118.1	-15.0	80.5 I	-2.6
1.38100E+07	EMTR	-9?.9	103.0 I	-1?2.0	-39.0	59.0 I	-135.5	-35.5	63.2	-1.6
1.57266E+07	RCPT	-101.1	103.0 I	-112.0	-53.0	42.1	-350.0	-247.0	-147.0 I	-1.0
2.65223E+07	EMTR	-101.6	103.0 I	-162.7	-59.7	42.1				
3.14573E+07	RCPT	-103.1	103.0 I	-164.0	-61.0	42.1 I				
5.09069E+07	EMTR	-102.4	103.0 I	-163.3	-60.3	42.1 I				
6.291-0E+07	RCPT	-99.1	103.0 I	-1.9.0	-56.0	42.1 I				
9.77109E+07	EMTR	-65.-	103.0 I	-146.2	-43.2	42.1 I				
1.25629E+08	RCPT	-53.1	23.2 IR	-5.4	-2.3	42.1 I				
1.87567E+08	EMTR	-72.3	-27.0 IR	-2.8	-25.3	42.1 I				
2.51650E+08	RCPT	-73.1	-27.0 IR	-5.9	-32.9	42.1 I				
3.59978E+08	EMTR	-73.0	-27.0 R	-8.9	-35.5	42.1 I				
5.03316E+08	RCPT	-112.4	32.4 I	-102.7	-7C.3	42.1 I				
6.90942E+08	EMTR	-133.4	103.0 I	-194.8	-91.6	42.1 I				
1.00663E+09	RCPT	-16.3	103.0 I	-201.2	-98.2	42.1 I				
1.32620E+09	EMTR	-14.6	107.0 I	-204.9	-101.0	42.1 I				
2.01327E+09	RCPT	-14.0	103.0 I	-206.9	-103.9	42.1 I				
2.54551E+09	EMTR	-1.0	103.0 I	-210.9	-10..3	42.1				
4.02653E+09	RCPT	-15.0	1C3.0 I								

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPD   EQPT 5 = DRDYL   PORT 2 = DRFX   (UNCHANGED)

RCPT -- SUBS = CNI . EQPT 1 = UHFCO   PORT 2 = COMLO   (UNCHANGED)

PATH = ANT TO ANT   (CCVTD)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND			BROADBAND			
				EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
4.382855E+09	EMTR	-191.7	103.0 I	-212.5	-169.1	-2.1 I				
8.053464E+09	RCPT	-122.3	103.3	-216.9	-113.3	-2.1 I				
9.377492E+09	EMTR	-157.3	103.0 I	-215.2	-114.2	-2.1 I				
7.61061E+10	RCPT	-112.1	103.3	-222.5	-114.9	+2.1 I				
1.60000E+10	EMTR	-143.1	103.9 I	-223.9	-120.3	+2.1				

INTEGRATED EMI MARGIN = 32.4

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

EMTR -- SUBS = IMGPD EQPT 5 = OBPYL PORT 3 = OBAX (UNCHANGED)

RCPT -- SUBS = CHI EQPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND EMI MARGIN	NARROWBAND RECEIVED SIGNAL	NARROWBAND EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	BROADBAND RECEIVED SIGNAL	BROADBAND EMITTER SPCT LEVEL	BDWDTH FACTOR
1.06076E+04	EMTR	-104.2	103.0 I	-165.1	-62.1	42.1				
1.53600E+04	RCPT	-104.2	103.0 I	-165.1	-62.1	42.1 I				
2.03602E+04	EMTR	-104.2	103.0 I	-165.1	-62.1	42.1				
3.87200E+04	RCPT	-104.2	103.0 I	-165.1	-62.1	42.1 I				
3.96795E+04	EMTR	-104.2	103.0 I	-165.1	-62.1	42.1				
6.14400E+04	RCPT	-104.2	103.0 I	-165.1	-62.1	42.1 I				
7.50093E+04	EMTR	-104.2	103.0 I	-165.1	-62.1	42.1				
1.22880E+05	EMTR	-104.2	103.0 I	-165.1	-62.1	42.1 I				
1.43973E+05	EMTR	-104.2	103.0 I	-165.1	-62.0	42.1				
2.45760E+05	RCPT	-104.2	103.0 I	-165.0	-62.0	42.1 I				
2.7c342E+05	EMTR	-104.2	103.0 I	-165.0	-62.0	42.1				
4.91520E+05	RCPT	-104.1	103.0 I	-165.0	-62.0	42.1	-286.2	-185.2	-21.0 IR	-60.0
5.30413E+05	EMTR	-104.1	103.0 I	-74.8	8.2	112.3 IR	-158.7	-55.7	108.4 R	-50.0
9.03040E+05	RCPT	-104.1	103.0 I	-64.0	39.0	143.1 R	-124.9	-21.8	142.2 IR	-60.0
1.00000E+06	EMTR	-104.1	103.0 I	-64.0	39.3	143.1 R	-124.0	-20.9	143.2 R	-60.0
1.01808E+06	EMTR	-104.1	103.0 I	-63.9	39.3	143.1 R	-123.9	-20.9	143.2 R	-60.0
1.95410E+06	EMTR	-104.0	103.0 I	-63.8	39.2	143.1 R	-123.3	-20.6	143.2 R	-60.0
1.96668E+06	RCPT	-105.9	103.0 I	-65.8	37.2	143.1 IR	-123.8	-20.8	143.2 IR	-60.0
3.75070E+06	EMTR	-105.1	103.0 I	-66.0	37.0	143.1 R	-125.7	-22.7	143.2 R	-60.0
3.93216E+06	EMTR	-105.1	103.0 I	-66.0	37.0	143.1 IR	-126.3	-23.0	143.2 IR	-50.0
4.00000E+06	RCPT	-105.2	103.0 I	-66.3	36.7	143.1 R	-126.2	-23.2	143.2 R	-60.0
5.00000E+06	EMTR	-105.2	103.0 I	-130.9	-27.9	83.1 IR	-218.0	-115.0	55.2 R	-60.0
7.19910E+06	EMTR	-111.0	103.0 I	-134.3	-31.3	90.4 I	-133.8	-30.8	83.2	-3.0
7.86432E+06	RCPT	-111.7	103.0 I	-155.8	-52.7	83.1 I	-136.9	-33.8	80.5 I	-2.6
1.36180E+07	EMTR	-113.9	103.0 I	-160.8	-57.7	63.1 I	-157.3	-54.3	63.2	-1.3
1.57286E+07	RCPT	-116.7	103.0 I	-190.6	-77.6	59.0 I	-363.8	-265.6	-148.0 I	-1.0
2.65223E+07	EMTR	-119.9	103.0 I	-190.6	-77.6	42.1 I				
3.1+573E+07	RCPT	-120.0	103.0 I	-181.9	-78.7	42.1 I				
5.00069E+07	EMTR	-121.5	103.0 I	-162.7	-79.7	42.1 I				
6.29146E+07	RCPT	-121.2	103.0 I	-152.1	-79.1	42.1 I				
9.77109E+07	EMTR	-111.9	103.0 I	-117.8	-7.8	42.1 I				
1.25829E+08	RCPT	-110.1	103.0 I	-165.0	-62.0	42.1 I				
1.875+7E+08	EMTR	-85.2	29.2 IR	-74.2	-4c.0	42.1 I				
2.51658E+08	RCPT	-90.7	-27.0 IR	-21.5	-46.5	42.1 I				
3.59972E+08	EMTR	-93.6	-27.0 IR	-24.7	-51.7	42.1 I				
5.03316E+08	RCPT	-95.7	-27.0 R	-27.5	-5c.0	42.1 I				
6.90942E+08	EMTR	-131.2	32.4 I	-121.5	-82.0	42.1 I				
1.00663E+09	RCPT	-152.7	103.0 I	-213.6	-11c.3	42.1 I				
1.32620E+09	EMTR	-153.1	103.0 I	-220.0	-117.0	42.1 I				
2.01327E+09	RCPT	-162.	103.0 I	-223.0	-120.0	42.1 I				
2.54551E+09	EMTR	-164.5	103.0 I	-225.7	-122.0	42.1 I				
4.02653E+09	RCPT	-153.6	103.0 I	-229.0	-122.0	42.1 I				

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

BASELINE SYSTEM INTRA-RCPT SELF INTERFERENCE

EMTR -- SUBS = IMGPD FOPT ? = ODPYL PORT 3 = 09AX (UNCHANGED)

RCPT -- SUBS = CNI FOPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT (CONTD)

NOTE - R = IN REPD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	──NARROWBAND──			──────BROADBAND──────			
				EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
4.36335E+09	EMTR	-172.7	103.0 I	-231.3	-128.3	+2.1				
6.23306E+09	RCPT	-17.5	103.0	-235.7	-132.7	+2.1 I				
9.37792E+09	EMTR	-17.51	103.0 I	-237.0	-133.7	+2.1				
1.61031E+10	RCPT	-195.7	103.0	-2.17	-133.7	+2.1 I				
1.80000E+10	EMTR	-195.5	103.0 I	-2.25	-133.7	+2.1				

INTEGRATED EMI MARGIN = 13.0

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS × IMGPD EQPT 6 = CENTL PORT 2 = CLFX (UNCHANGED)

RCPT -- SUBS = CN1 EQPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	ERX MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	ERX MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BWDTH FACTOR
				NARROWBAND			BROADBAND			
1.06076E+04	EMTR	-89.2	103.0 I	-150.1	-47.1	42.1				
1.55360E+04	RCPT	-89.2	103.0 I	-150.1	-47.1	42.1 I				
2.03662E+04	EMTR	-89.2	103.0 I	-150.1	-47.1	42.1				
3.07200E+04	RCPT	-89.2	103.0 I	-150.1	-47.1	42.1 I				
3.20795E+04	EMTR	-89.2	103.0 I	-150.1	-47.0	42.1				
6.14400E+04	RCPT	-89.2	103.0 I	-150.1	-47.0	42.1 I				
7.50093E+04	EMTR	-89.2	103.0 I	-150.1	-47.0	42.1				
1.22860E+05	RCPT	-89.2	103.0 I	-150.0	-47.0	42.1 I				
1.43973E+05	EMTR	-89.2	103.0 I	-150.0	-47.0	42.1				
2.45760E+05	RCPT	-89.2	103.0 I	-150.0	-47.0	42.1 I				
2.70342E+05	EMTR	-89.2	103.0 I	-150.0	-47.0	42.1				
4.91520E+05	RCPT	-89.1	103.0 I				-273.2	-170.2	-21.0 IR	-60.0
5.30413E+05	EMTR	-89.1	103.0 I	-79.9	23.2	112.1 IR	-143.7	-40.7	108.4 R	-60.0
9.83040E+05	RCPT	-89.1	103.0 I	-9.0	50.6	143.1 R	-109.8	-5.8	142.2 IR	-60.0
1.00000E+06	EMTR	-89.1	103.0 I	-68.9	54.1	143.1	-108.3	-5.9	143.2 R	-60.0
1.01808E+06	EMTR	-89.0	103.0 I	-48.8	54.2	143.1 R	-108.8	-5.8	143.2 R	-60.0
1.95410E+06	RCPT	-89.0	103.0 I	-48.8	54.2	143.1 R	-108.8	-5.8	143.2 R	-60.0
1.96608E+06	EMTR	-88.0	103.0 I	-8.8	54.2	143.1 IR	-108.8	-5.7	143.2 IR	-58.0
3.75070E+06	EMTR	-88.7	103.0 I	-8.0	54.7	143.1 IR	-108.5	-5.6	143.2 IR	-60.0
3.53216E+06	RCPT	-85.5	103.0 I	-8.7	54.3	143.1 R	-108.7	-5.7	143.2 R	-60.0
4.00000E+06	EMTR	-90.5	103.0 I				-207.9	-104.9	53.2 R	-60.0
5.00000E+06	EMTR	-91.6	103.0 I	-111.7	-0.7	83.1	-114.7	-11.6	83.2	-3.0
7.19910E+06	RCPT	-92.2	103.0 I	-115.1	-12.1	80.4 I	-117.6	-14.6	80.5 I	-2.6
7.66432E+06	EMTR	-95.7	103.0 I	-136.6	-33.5	63.1	-135.1	-35.1	63.2	-1.6
1.38180E+07	RCPT	-97.5	103.0 I	-1.16	-36.0	59.0 I	-349.5	-246.6	-148.0 I	-1.0
1.57286E+07	EMTR	-100.7	103.0 I	-101.6	-58.5	42.1				
2.65223E+07	RCPT	-101.4	103.0 I	-102.3	-59.3	42.1 I				
3.16573E+07	EMTR	-102.7	103.0 I	-1.3.5	-66.5	42.1 I				
5.09069E+07	RCPT	-102.7	103.0 I	-102.9	-59.9	42.1 I				
6.29146E+07	EMTR	-97.7	103.0 I	-105.6	-51.5	42.1				
9.77109E+07	RCPT	-97.7	103.0 I	-105.0	-42.4	42.1 I				
1.20029E+08	EMTR	-83.3	103.0 I	-1.5.0	-20.9	42.1 I				
1.87547E+08	EMTR	-71.2	29.2 IR	-2.4	-24.4	42.1 I				
2.51656E+08	RCPT	-77.7	-27.0 IR	-5.5	-32.3	42.1 I				
3.59978E+08	RCPT	-77.5	-27.0 R	-8.1	-31.4	42.1 I				
5.03316E+08	EMTR	-112.0	32.4	-102.3	-59.9	42.1				
6.30942E+08	RCPT	-133.5	103.0 I	-194.	-91.	42.1 I				
1.00663E+09	EMTR	-133.9	103.0 I	-200.3	-97.6	42.1				
1.32620E+09	RCPT	-163.0	103.0 I	-204.7	-101.4	42.1 I				
2.01327E+09	EMTR	-163.5	103.0 I	-206.5	-103.5	42.1				
2.55151E+09	RCPT	-163.0	103.0 I	-210.5	-107.5	42.1 I				

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPU   EQPT 6 = CENTL   PORT 2 = CLFX   (UNCHANGED)

RCPT -- SUBS = CNI   EQPT 1 = UHFCO   PORT 2 = COMLO   (UNCHANGED)

PATH = ANT TO ANT   (CONT'D)

NOTE - R = IN PEAK RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	EMI MARGIN	NARROWBAND RECEIVED SIGNAL	EMITTER SPCT LEVEL	EMI MARGIN	BROADBAND RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
4.0326E+09	EMTR	-1.1.3	103.0 I	-212.1	-109.1	42.1				
6.0306E+09	RCPT	-15.0	157.0	-216.0	-113.	-72.1 I				
9.37792E+09	EMTR	-15.5	103.0 I	-217.3	-114.	-72.1				
1.01061E+10	RCPT	-25.1.	103.0	-222.3	-119.	-72.1 I				
1.8000E+10	EMTR	-15.2.	133.0 I	-223.0	-126.	42.1				

INTEGRATED EMI MARGIN = 32.8

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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BASELINE SYSTEM EMTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPO   EQPT 6 = CENTL   PORT 3 = CLAX   (UNCHANGED)

RCPT -- SUBS = CNI   EQPT 1 = UHFCO   PORT 2 = COMLO   (UNCHANGED)

PATH = ANT TO ANT

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	WIDTH FACTOR
1.06076E+04	EMTR	-116.9	103.0 I	-177.8	-74.8	42.1				
1.53600E+04	RCPT	-115.9	103.0 I	-177.8	-74.8	42.1				
2.03602E+04	EMTR	-116.9	103.0 I	-177.8	-74.8	42.1				
3.07200E+04	RCPT	-115.9	103.0 I	-177.8	-74.8	42.1 I				
3.90795E+04	EMTR	-116.9	103.0 I	-177.8	-74.8	42.1				
6.14400E+04	RCPT	-115.9	103.0 I	-177.8	-74.8	42.1 I				
7.50093E+04	EMTR	-116.9	103.0 I	-177.8	-74.8	42.1				
1.22880E+05	RCPT	-115.9	103.0 I	-177.8	-74.8	42.1 I				
1.43973E+05	EMTR	-116.9	103.0 I	-177.8	-74.8	42.1				
2.45760E+05	RCPT	-116.9	103.0 I	-177.8	-74.7	42.1 I				
2.76342E+05	EMTR	-116.9	103.0 I	-177.8	-74.7	42.1				
4.91520E+05	RCPT	-115.9	103.0 I			42.1				
5.30413E+05	EMTR	-116.6	103.0 I	-107.5	-44.5	112.3 IR	-300.9	-197.9	-21.0 IR	-60.0
9.83040E+05	RCPT	-116.8	103.0 I	-76.7	26.3	143.1 R	-171.4	-68.4	188.4 R	-60.0
1.00000E+06	EMTR	-116.6	103.0 I	-76.5	26.4	143.1 R	-137.6	-34.6	142.2 IR	-60.0
1.01808E+06	EMTR	-115.7	103.0 I	-76.5	26.4	143.1 R	-136.7	-33.7	143.2 R	-60.0
1.95410E+06	RCPT	-110.7	103.0 I	-76.5	26.0	143.1 R	-136.6	-33.6	143.2 R	-60.0
3.66608E+06	EMTR	-117.1	103.0 I	-77.0	26.0	143.1 R	-136.5	-33.5	143.2 R	-60.0
3.75070E+06	RCPT	-117.3	103.0 I	-77.0	26.0	143.1 IR	-136.5	-33.5	143.2 IR	-60.0
3.93216E+06	EMTR	-117.3	103.0 I	-77.2	25.0	143.1 IR	-137.2	-34.2	143.2 IR	-60.0
4.00000E+06	RCPT	-117.6	103.0 I	-77.5	25.5	143.1 R	-137.4	-34.4	143.2 R	-60.0
5.00000E+06	EMTR	-128.4	103.0 I	-142.1	-39.1	83.1 I	-236.3	-135.2	53.2 R	-60.0
7.19910E+06	RCPT	-122.2	103.0 I	-145.5	-42.5	80.4 I	-145.0	-42.0	83.2	-3.0
7.86432E+06	RCPT	-122.9	103.0 I	-167.0	-63.9	63.1 I	-148.3	-45.0	90.5 I	-2.5
1.38180E+07	EMTR	-127.1	103.0 I	-172.0	-68.9	59.0 I	-169.5	-65.5	63.2	-1.6
1.57286E+07	RCPT	-127.9	103.0 I	-192.0	-89.0	42.1 I	-383.6	-277.0	-48.0 I	-1.0
2.65223E+07	EMTR	-131.1	103.0 I	-192.6	-89.6	42.1 I				
3.14573E+07	RCPT	-131.8	103.0 I	-193.9	-90.9	42.1 I				
5.09069E+07	EMTR	-133.0	103.0 I	-193.3	-90.3	42.1 I				
6.29106E+07	RCPT	-132.4	103.0 I	-189.0	-85.0	42.1 I				
9.77109E+07	EMTR	-122.1	103.0 I	-176.2	-73.2	42.1 I				
1.25829E+08	RCPT	-115.3	103.0 I	-65.4	-57.2	42.1 I				
1.57547E+08	EMTR	-99.1	26.2 IR	-32.5	-59.6	42.1 I				
2.51658E+08	RCPT	-101.5	-27.0 IR	-35.9	-62.7	42.1 I				
3.59978E+08	EMTR	-10.0	-27.0 IR	-38.1	-65.0	42.1 I				
5.03316E+08	RCPT	-10.3	-27.0 R	-132.7	-100.2	42.1 I				
6.90942E+08	EMTR	-142.1	32.4	-224.8	-121.5	42.1 I				
1.00663E+09	RCPT	-163.9	103.0 I	-234.2	-126.2	42.1 I				
1.32620E+09	EMTR	-170.3	103.0 I	-234.9	-131.9	42.1 I				
2.01327E+09	RCPT	-173.3	103.0 I	-236.9	-133.9	42.1 I				
2.54551E+09	EMTR	-170.0	133.0	-137.0	-137.0	42.1				
4.02653E+09	RCPT	-180.0	133.0							

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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BASELINE SYSTEM INTERCEPT PAIR INTERFERENCE

EMTR -- SUBS = IMGPD EQPT 6 = CENTL PORT 3 = CLAX (UNCHANGED)

RCPT -- SUBS = CNI EQPT 1 = UHFCO PORT 2 = COMLO (UNCHANGED)

PATH = ANT TO ANT   (CONTD)

NOTE - R = I + REGD RANGE, I = INTERPOLATED VALUE

FREQUENCY (MFPT7)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	NARROWBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BROADBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BNDWTH FACTOR
4.98565E+09	EMTR	-161.6	153.0 I	-21.25	-130.0	-2.1				
8.03306E+09	RCPT	-161.5	153.0	-24.09	-143.5	+2.1 I				
9.37792E+09	EMTR	-161.3	153.0 I	-24.82	-145.2	42.1				
1.61061E+10	RCPT	-192.5	153.0	-22.23	-149.3	42.1 I				
1.63003E+10	EMTD	-193.0	153.0 I	-23.8	-150.3	42.1				

INTEGRATED EMI MARGIN =   2.4

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

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FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL		NARROWBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL		BROADBAND EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BCWDTH FACTOR
1.06076E+04	EMTR	-67.9	103.0	I	-149.9	-46.9	43.0					
1.53600E+04	RCPT	-89.9	103.0	I	-149.9	-46.9	43.0	I				
2.03602E+04	EMTR	-69.9	103.0	I	-149.9	-46.9	43.0					
3.07200E+04	RCPT	-89.9	103.0	I	-149.9	-46.9	43.0	I				
3.90795E+04	EMTR	-69.9	103.0	I	-149.9	-46.9	43.0					
6.14400E+04	RCPT	-89.9	103.0	I	-149.9	-46.9	43.0					
7.50093E+04	EMTR	-89.9	103.0	I	-149.9	-46.3	43.0					
1.22880E+05	RCPT	-89.9	103.0	I	-149.9	-46.9	43.0					
1.43873E+05	FMTR	-89.9	103.0	I	-149.3	-46.9	43.0					
2.45760E+05	RCPT	-83.9	103.0	I	-149.9	-46.9	43.0	I				
2.76342E+05	EMTR	-89.9	103.9	I	-149.3	-46.3	43.0					
4.91520E+05	RCPT	-83.8	103.	I	-149.8	-46.6	43.0	I				
5.30413E+05	EMTR	-89.6	103.0	I	-149.8	-46.8	43.0					
9.83040E+05	RCPT	-89.8	103.0	I	-149.8	-46.8	43.0					
1.01808E+06	EMTR	-89.5	103.0	I	-149.8	-46.8	43.0	I				
1.95410E+06	EMTR	-89.7	103.0	I	-149.7	-46.7	43.0					
1.96608E+06	RCPT	-89.7	103.0	I	-149.7	-46.7	43.0					
3.75070E+06	EMTR	-89.5	103.0	I	-149.5	-46.5	43.0					
3.93216E+06	RCPT	-83.4	103.0	I	-149.4	-46.4	43.0	I				
7.19910E+06	EMTR	-83.2	103.0	I	-149.2	-46.2	43.0					
7.86432E+06	RCPT	-89.9	103.0	I	-149.9	-46.5	43.0	I				
1.38180E+07	EMTR	-94.1	103.0	I	-154.1	-51.1	43.0	I				
1.57286E+07	RCPT	-94.9	103.0	I	-154.9	-51.9	43.0	I				
2.65223E+07	EMTR	-98.1	103.0	I	-158.1	-55.1	43.0	I				
3.14573E+07	RCPT	-93.8	103.0	I	-160.8	-55.7	43.0	I				
5.09069E+07	EMTR	-100.1	103.0	I	-160.1	-57.0	43.0	I				
6.29146E+07	RCPT	-99.4	103.0	I	-159.4	-56.4	43.0	I				
9.77109E+07	EMTR	-95.1	103.0	I	-155.1	-52.1	43.0	I				
1.25829E+08	RCPT	-82.3	103.0	I	-142.3	-39.3	43.0	I				
1.87747E+08	EMTR	-65.4	29.2	IR	-7.5	-23.4	43.0	I				
2.51658E+08	RCPT	-63.9	-27.0	R	1.1	-2.3	43.0	I				
3.59972E+08	EMTR	-72.0	-27.0	IR	-2.0	-23.0	43.0	I				
5.03316E+08	RCPT	-7.3	-27.0	R	-4.9	-31.3	43.0	I				
6.90942E+08	EMTR	-109.4	32.4	I	-98.8	-61.4	43.0	I				
1.00663E+09	RCPT	-130.3	103.0	I	-190.3	-87.3	43.0	I				
1.32620E+09	EMTR	-137.3	103.0	I	-197.3	-9.3	43.0	I				
2.01327E+09	RCPT	-140.9	103.0	I	-200.3	-97.3	43.0	I				
2.54515E+09	EMTR	-143.1	103.0	I	-263.3	-100.0	43.0	I				
4.02653E+09	RCPT	-147.0	103.0	I	-133.7	-3.7	115.3	IR	-246.2	-145.2	-8.2	IR	10.0
4.20000E+09	FMTR	-147.3	133.0	I	-127.3	-24.3	123.0	R	-157.3	-54.3	83.0	R	10.0
4.30000E+09	EMTR	-14.5	133.0	I	-127.0	-24.0	123.0	R	-157.2	-54.5	83.0	R	10.0
4.40000E+09	EMTR	-147.7	103.0	I	-127.7	-22.7	123.0	R	-157.7	-54.7	83.0	R	16.0

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

BASELINE SYSTEM - MTR-RCPT PAIR INTERFERENCE

EMTR -- SUBS = KOALT   FOPT / = RTUNT   PORT 2 = RFOUT   (UNCHANGED)

RCPT -- SUBS = CMI   FOPT 1 = UHFCO   PORT 2 = COMLO   (UNCHANGED)

PATH = ANT TO ANT   (CONTD)

NOTE - R = IN READ RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	FREQ BASE	TRANSFER RATIO	RECEPTOR SUSC LEVEL	--NARROWBAND-- EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	--BROADBAND-- EMI MARGIN	RECEIVED SIGNAL	EMITTER SPCT LEVEL	BDWDTH FACTOR
4.89505E+09	EMTR	-1...	103.0 I	-208.0	-10.0	43.0	-37.0	-334.6	-200.6 I	19.1
6.03306E+09	RCPT	-103.0	103.0	-162.3	-79.3	73.7 I	-19.0	-91.6	43.0	13.7
9.37792E+09	EMTR	-10.3	103.0 I	-1.3	-71.3	63.0	-19.0	-83.9	43.0 I	22.1
1.61061E+10	RCPT	-1...	103.9	-179.0	-78.0	83.0 I	-19.0	-94.4	43.0	22.0
1.63000E+10	EMTR	-1...	103.0	-150.0	-7.0	83.0	-19.0			

INTEGRATED EMI MARGIN = 36.3

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCC COMLO

ENVIRONMENTAL FIELD INTERFERENCE SUMMARY

RCPT -- SUBS = CNI   EQPT 1 = UHFCO   PORT 2 = COMLO

FREQUENCY (HERTZ)	EMI MARGIN	RECEPTOR SUSC LEV	RECEIVED SIG-DB	RECEIVED SIG-NUM
7.63000E+03	117.1	103.0	220.1	1.0118E+11
1.53600E+04	106.1	103.5	209.1	2.5299E+10
3.07200E+04	93.0	103.0	196.0	1.3274E+09
6.14400E+04	91.0	103.0	167.6	1.3831E+09
1.22860E+05	74.3	103.0	177.3	1.3071E+08
2.45760E+05	66.7	103.0	171.3	3.6656E+08
4.91520E+05	62.3	103.0	165.3	1.4495E+08
9.83040E+05	53.0	103.0	1.0+0.0	1.3339E+07
1.96608E+06	41.2	103.0	147.2	1.6274E+07
3.93216E+06	29.5	103.0	132.7	1.2925E+06
7.86432E+06	18.6	103.0	121.6	1.1973E+05
1.57266E+07	9.5	103.0	111.5	3.7510E+05
3.14573E+07	.5	103.0	103.6	1.5504E+05
6.29146E+07	-.5	103.0	102.5	1.3339E+05
1.25829E+08	33.6	104.0	135.7	1.8030E+36
2.51658E+08	195.0	-27.0	1.56.0	7.9667E+37
5.03316E+08	166.9	-27.0	139.9	9.0834E+36
1.00663E+09	-81.0	103.0	22.0	1.2504E+01
2.01327E+09	-103.6	103.0	-.5	9.3739E-01
4.02653E+09	-115.6	103.1	-12.6	2.3435E-01
8.05306E+09	-1103.0	103.0	-1000.0	0.
1.61061E+10	-1103.0	103.0	-1000.0	0.
3.22123E+10	-1103.0	103.0	-1000.0	0.

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

BASELINE SYSTEM INTERFERENCE FROM TOTAL SIGNAL

RCPT -- SUBS = CMI   EQPT 1 = UHFCO PORT 2 = COMLO   (UNCHANGED)

NOTE - R = IN REQD RANGE, I = INTERPOLATED VALUE

FREQUENCY (HERTZ)	RECEPTOR SUSC LEVEL	EMI MARGIN	TOTAL RCVD SIGNAL
7.6800E+03	103.0	7.0	110.1
1.5360E+04	103.0	1.0	104.0
3.0720E+06	103.0	-5.0	98.0
6.1440E+04	103.0	-11.0	92.0
1.2288E+05	103.0	-14.4	84.0
2.4576E+05	103.0	-17.4	85.0
9.8304E+05	103.0	-20.4	82.7
1.9661E+06	103.0	-24.9	78.1
1.9661E+06	103.0	-33.6	72.4
3.9322E+06	103.0	-35.7	67.4
7.8643E+06	103.0	-2.2	60.0
1.5729E+07	103.0	-7.3	55.0
3.1457E+07	103.0	-51.1	51.9
6.2915E+07	103.0	-51.7	51.3
1.2583E+08	103.0	-34.7	51.3
2.5166E+08	-27.0 R	105.0	79.0
5.0332E+08	-27.0 R	96.9	59.9
1.0066E+09	103.0	-92.0	11.3
2.0133E+09	103.0	-103.3	-.3
4.0265E+09	103.0	-1.9.2	-6.2
8.0531E+09	103.0	-17.3	-71.3
1.6106E+10	103.0	-1103.0	-1000.0
3.2212E+10	103.0	-1103.0	-1000.0

TOTAL INTEGRATED EMI MARGIN = +1.2

FIGURE 39 (Continued)
TART OUTPUT FOR MINI-SYSTEM
RCPT = UHFCO COMLO

Section 6

PROGRAM OPERATION

This section discusses the operation of IEMCAP including initial stages of implementation, maintaining the program, termination and restart, and FORTRAN source updating.

6.1 PROGRAM IMPLEMENTATION

Procedures for operating the two sections of IEMCAP are given below. As there will be different methods of operation at different installations, the step-by-step procedure outlined below describes one method of operation on a CDC 6600 with suggested alternatives.

6.1.1 Storing the Source Program

IEMCAP is comprised of approximately 16,000 FORTRAN source statements, 9000 for IDIPR and 7000 for TART. Hence, the source program is usually stored on a disk file to avoid having to submit five boxes of cards each time the program is run. The details of doing this will vary with different computers and with different installations. The implementation used on the CDC 6600 was to store each section of the program on a disk file using MODIFY, a source file library editing program that maintains and updates a system of programs in any source language. If the user is not familar with the method used at his installation he should check with his computer systems personnel. It is not absolutely necessary to store the source program, but merely a convenience, especially if any updating of the FORTRAN source is required.

An alternative to storing the source program is to store only the compiled binary out, as discussed below.

6.1.2 Compiling the Program and Storing the Binary Output

IDIPR and TART are compiled using a FORTRAN compiler. The binary relocatable output for IDIPR and TART is saved, and this binary file is loaded and executed. On the CDC 6600, the output of the compiler is a file called "LGO." It is saved after compilation, and all future runs are made by loading and executing this file. If changes are made to the source, it must be recompiled. On CDC 6600, the MODIFY program is invoked to transfer the source file from the program library to a file called "COMPILE" which is input to the compiler. A binary file is created by the compiler using the control statement RUN23 to invoke the CDC FORTRAN compiler, Version 2.3 or by FTN to invoke the FORTRAN extended compiler, Version 3.

6.1.3 Executing the Program

Once the source file has been compiled the binary file is loaded and executed for each run. The control statement to execute the program varies with the computer. On the CDC 6600, a binary relocatable file can be loaded and executed by the job control statement, LGO.

APPENDIX A

COMPUTED GENERATED SPECIFICATION TEST METHODS

A.1   PURPOSE AND SCOPE

The following test methods are recommended as those which will allow the program user to correlate measured data on equipment with the specification limits generated by the Specification Generation Routine (SGR). The measured data will also be fed back into the program for more detailed system compatibility analysis.

The recommendations include a system test method and subsystem/equipment test methods. The system test method includes equipment interaction tests and a limited number of critical line tests. The subsystem/equipment test methods include conducted emission on each interconnect wire, conducted susceptibility on each wire, radiated emission from equipment cases, and radiated susceptibility of equipment cases.

A.2   SYSTEM TEST METHODS

The test methods specified in MIL-E-6051 are recommended for use as system test requirements. The system tests will consist of equipment interactions and critical line measurements. The definition of critical lines will be established by the user and may include any safety margins the user chooses to select. The test criteria, including definition of critical lines and test levels, will be obtained from the results of the system computerized analysis and subsystem/equipment tests. Standard voltage and current measurement techniques can be tailored to the specific line to be measured.

These tests are concerned with only intrasystem compatibility therefore no system emission tests are to be performed. The intrasystem environment is defined by the computer program analysis and the subsystem test data, thereby eliminating the need to measure the system environment parameters during the system tests. The system tests will include only those cases where the analyses indicate questionable operational margins.

A.3   SUBSYSTEM/EQUIPMENT TEST METHODS

A.3.1   TEST LIMIT GENERATION

The test limits for subsystem/equipment testing are based on allowable extraneous emissions from equipment interconnect wiring and cases, and susceptibility of the wiring and cases to levels equal to the effects of these emissions. The interconnect wiring consists of all types of wiring including power wiring, signal wiring between equipments, and coax cables between RF equipment and their associated antennas. The computer program will generate an emission and susceptibility limit for each emitter and/or receptor depending on circuit characteristics. The limits are set for each

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The user should decide before submitting the run what files he wishes to save upon abnormal termination and supply the proper control cards. In all cases, for IDIPR OLD or MODIFY runs or any TART run, care should be exercised to save the input files so they can be re-used once the nature of the abnormal termination is determined. On the CDC 6600, a special control card, EXIT, allows the user to specify the disposition of all files upon an abnormal termination; hence, all old files and any new files to be created during the run can be saved.

Restarting a program after an abnormal termination will depend upon several factors. Hence, the user must determine the nature of the termination and decide which of the below solutions is most expeditious and cost effective for his case. The three suggested restarts are given below:

1. Re-submit with no change. This is done if the factors are as follows:

   a. The cause of the termination was outside the user's realm, such as the computer "going down."

   b. Little execution was done prior to termination.

   c. No new data sets were saved.

   d. Even though partial new data sets were saved, the total job time is small enough to make resubmitting more efficient than setting up a new data set structure to use the partially created data sets.

2. Make data correction and re-submit with same data set up. If the nature of the termination is determined to have been caused by bad data but the factors describing the case are essentially as described in (1), the data should be corrected and the job resubmitted.

3. Make new data file set up definition and re-submit. The user may wish to use the partial output of the abnormally terminated run in the following cases:

   a. The execution time has been considerable.

   b. Partially created data sets have been saved.

   c. A re-start is available as either a MODIFY run to change the data on the ISF or an OLD run using the ISF unchanged, as discussed in Sections 3.1.2 and 3.3. As an example, assume that during an IDIPR NEW run, 40 equipments with a total of 250 ports had initial spectra successfully generated, but on the forty-first and last equipment, an abnormal termination occurred. If the ISF was saved by means of an abnormal termination command,

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the ISF could be used as input to a MODIFY run with cards used to correct the error in the forty-first equipment data. However, the work files are not useable on an abnormal termination, and these must be regenerated on the MODIFY run for all the equipments.

6.4 SOURCE FILE UPDATING

If a change in the source file is required or perhaps an entire routine is being replaced, the following steps are required:

1. Recreate the source file. This can be done most expeditiously through a file editing routine such as CDC 6600 MODIFY. However, the changes could be made to the original card deck and procedures for initiating the program followed.

2. Compile only the changes routines and update the binary deck. The source decks which have been changed would be compiled and a binary file management routine (such as the CDC 6600 LIBEDIT) used to replace the changed routines in the binary files. An alternative to this is to recompile all routines and save a new binary file.

APPENDIX A

COMPUTED GENERATED SPECIFICATION TEST METHODS

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The recommendations include a system test method and subsystem/equipment test methods. The system test method includes equipment interaction tests and a limited number of critical line tests. The subsystem/equipment test methods include conducted emission on each interconnect wire, conducted susceptibility on each wire, radiated emission from equipment cases, and radiated susceptibility of equipment cases.

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The test methods specified in MIL-E-6051 are recommended for use as system test requirements. The system tests will consist of equipment interactions and critical line measurements. The definition of critical lines will be established by the user and may include any safety margins the user chooses to select. The test criteria, including definition of critical lines and test levels, will be obtained from the results of the system computerized analysis and subsystem/equipment tests. Standard voltage and current measurement techniques can be tailored to the specific line to be measured.

These tests are concerned with only intrasystem compatibility therefore no system emission tests are to be performed. The intrasystem environment is defined by the computer program analysis and the subsystem test data, thereby eliminating the need to measure the system environment parameters during the system tests. The system tests will include only those cases where the analyses indicate questionable operational margins.

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A.3.1 TEST LIMIT GENERATION

The test limits for subsystem/equipment testing are based on allowable extraneous emissions from equipment interconnect wiring and cases, and susceptibility of the wiring and cases to levels equal to the effects of these emissions. The interconnect wiring consists of all types of wiring including power wiring, signal wiring between equipments, and coax cables between RF equipment and their associated antennas. The computer program will generate an emission and susceptibility limit for each emitter and/or receptor depending on circuit characteristics. The limits are set for each

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input or output terminal of the equipment. The mechanics for generating these limits are described in the paragraphs on SGR.

The emitter limits are related to MIL-STD-461 limits in that the basic emission curves of MIL-STD-461 are adjusted by the computer program to apply to a specific equipment port. The receptor limits are based on the receptor circuit bandwidth, threshold sensitivity levels, and the system environment due to the emitter effects.

The emission limits for equipment interconnect wires are specified in terms of both broadband and CW current levels versus a given frequency spectrum conducted on each wire. Each wire has unique limits. The susceptibility limits are plotted as the equivalent CW current levels versus frequency that the receptor wires must tolerate. There are no limits generated by the program directly relating to the radiated limits of MIL-STD-461 for wiring.

Emissions from equipment cases are specified in terms of the radiated field existing 1 meter from the case. The limits are adjusted from the limits of test method RE02 of MIL-STD-461 and are tailored to each case depending on subsystem configuration. The case susceptibility limits are established by comparison of the receptor circuit thresholds within the equipment case to the fields existing outside the case. These fields are specified by the system internal environment.

A.3.2 APPLICABLE TEST METHODS

A.3.2.1 Emission Tests

Emission tests will consist of current measurements on the equipment interconnect wiring and field intensity measurements of the radiation from equipment cases.

A3.2.1.1 Conducted Current Measurements - The most feasible means of measuring the current on a non-coax wire without disturbing the circuit characteristics is with a current probe. Present current probe technology allows calibrated current probe measurements although it is not expected that measurements for extraneous RF emissions on wires carrying unintentionally generated RF currents will be required above 1 GHz. Coax lines will be measured either by direct connection to an RF receiver, or where the power levels are greater than the power handling capabilities of the receiver, an RF power sampling device such as a directional coupler will be used to measure the RF current on the coax line.

Since the current limits are given for each equipment port, the current measurement must be made on each individual wire connected directly to that port (before any branching point). A precaution that must be observed when using the current probe is that the maximum current point along the line will vary with frequency when the line length approaches a significant portion of a wavelength. The current probe must therefore be moved along

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the line to obtain a maximum reading because the SGR computes the maximum allowable current from the port without regard to any standing wave effects.

A.3.2.1.2 **Conducted Current Test Setups** - The physical configuration of the test setup for conducted current measurements will be similar to that of MIL-STD-462, Method CE03. Differences include possible elimination of the 10 microfarad feedthru capacitors in the power lines, height of the test bundle above the ground plane, and cable lengths.

The 10 microfarad feedthru capacitors may be eliminated from the test setup if a measurement of the ambient current on each power line shows the current from the power source is below the test wire current limit by at least 6 dB.

The height above the ground plane of the wire being measured can be any convenient height.

Cable lengths used for the test setup can be any convenient length. The only limitation is the size of the test area.

A.3.2.1.3 **Equipment Case Radiation** - The test method for equipment case radiation must relate to the computer generated test limits. The limits are specified in terms of field strength versus frequency at a distance of 1 meter from the test sample. The measurement method will therefore be the same as that of MIL-STD-462, Test Method RE02.

Case radiation does not, of course, include wire radiation; therefore the test setup must reflect this condition. This means that the wiring must be electromagnetically isolated from the measuring antenna. An alternative is that the test requirements are considered to be satisfied if the combined radiation from the case and wiring is below the case radiation limits.

A.3.2.2 **Susceptibility Tests**

Susceptibility tests will be performed to measure the susceptibility of equipment to a specified value of current impressed on interconnect wiring and to a radiation field impressed on the equipment case. Inter-modulation tests for receivers are to be performed in accordance with MIL-STD-462, Method CS03. Frequency intermodulation products will be selected from the utility program for intermodulation.

A.3.2.2.1 **Conducted Susceptibility** - Conducted susceptibility tests will be accomplished by inducing a current on each specified receptor wire leading into an equipment. The induced current levels are to be those specified in the susceptibility test limit for that receptor.

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The most feasible method for inducing the specified current levels into non-coax wires is the current probe method used in measurement of conducted current emissions. This method eliminates the need to break into the receptor circuit directly which would change the circuit parameters. A second current probe can be clamped around the receptor wire close to the equipment input terminal to measure the injected current. The proper injection point for the source probe is that point along the line which provides the proper current level at the equipment input terminal with the least amount of power applied to the probe. This is required when the line length approaches a significant portion of a wavelength.

A.3.2.2.2 <u>Radiated Susceptibility</u> - Radiated susceptibility tests are to be performed to determine the susceptibility of the equipment internal circuitry to a radiated field at the equipment case. The method for developing this field is similar to that for MIL-STD-462, Test Method RS03. The field generating setup can be calibrated to produce a specified field at a distance of 1 meter from the transmitting antenna as in MIL-STD-462 or at a distance specified by the user. The primary consideration is the field level at the equipment case.

The test limits apply only to the levels existing at the equipment case but the wire bundles can be included with certain conditions applied. The wire bundles can be included if the combination of the case and wire bundle susceptibility tests show no effects from the field specified for the case alone.

A.3.2.3 Test Instrumentation

The test instrumentation to be used for these test measurements is the standard equipment used in MIL-STD-462 testing. The test methods for emission tests can be easily accomplished with automatic or semiautomatic measurement techniques. Test probes and antennas are readily available in most test labs. The conducted measurements could be accomplished without setting up in a shielded room but a shielded room is necessary for the radiated measurements.

A.4   SAMPLE TEST PROCEDURE

A.4.1 The following test procedure is presented as an example of the application of the SGR test methods to a subsystem unit. A single unit procedure is sufficient illustration since the SGR specifies individual wire current limits and individual box radiation.

A.4.2   OBJECTIVES AND SUCCESS CRITERIA

The objectives and success criteria of these tests are as follows:

a.   Conducted Current Measurements – to determine whether extraneous current is present on each of the external interconnect wires to the unit. The success criteria is that these extraneous emissions do not exceed the levels specified in Figures A-5 thru A-12.

b.   Conducted Susceptibility Measurements – to determine whether there is a response in the output of the receiver when the specified current levels, Figures A-15 and A-16 are applied to the RF and power wire, respectively. The success criteria is the range and bearing indicator does not lose lock.

c.   Case Radiated Emission – to determine whether the radiation from the case exceeds the case radiation limits of Figures A-13 and A-14. The success criteria is that the case radiation is less than the spec limits.

d.   Case Radiated Susceptibility – to determine whether there is a receiver output response when the case is subjected to a radiated field at the levels specified in Figure A-17. The success criteria is the range and bearing indicator does not lose lock.

A.4.3   TEST SAMPLE DESCRIPTION

The test sample is an airborne TACAN R/T unit. It has a transmitter and receiver packaged in a single unit. For the purposes of this example it is assumed that there are 5 wires interfacing with the unit. These consist of 1) RF coax to upper antenna, 2) Audio output, 3) Heading output, 4) Primary power input, and 5) Bearing output. The audio output of the receiver is fed to a speaker for a convenient aural indication.

A.4.4 INSTRUMENTATION

All measurements shall be made with instruments whose accuracies conform to acceptable laboratory standards, and which are appropriate for measurement of the parameter concerned. The accuracy of the instrument and test equipment shall be verified periodically utilizing acceptable calibration procedures as defined by MIL-C-45662A, "Calibration System Requirements."

A.4.4.1 Placement and Selection of Measuring Antennas

Each face of the test sample shall be probed with a 3-inch electrostatic probe to determine the localized area(s) producing maximum emission or susceptibility. Those areas shall be located 1 meter from the applicable test antenna. Probing shall be performed using a spectrum analyzer to determine the worse case condition. The probe shall be oriented for maximum pickup approximately 5 cm from the surface of the test sample.

When performing radiated emission measurements, no point of the measuring antenna shall be less than 1 meter from the walls of the enclosure or obstruction.

For susceptibility measurements no point of the field-generating and the field-measuring antennas shall be less than 1 meter from the walls of the enclosure or obstruction.

For radiated emission measurements between 25 and 200 MHz, the biconical antenna shall be positioned alternately to measure the vertical and horizontal components of the emission. For radiated susceptibility measurements between 20 and 200 MHz, the biconical antenna shall be positioned so as to generate alternately vertical and horizontal fields.

A.4.4.2 Measuring Frequencies

The entire specified frequency range for each applicable test shall be scanned. Measurements shall be taken at not less than three frequencies per octave representing the maximum indications within the octave. All measurements will be made using the peak detector function of the measurement receiver.

A.4.4.3 Ground Plane

A copper ground plane which is 0.75 mm thick and 4.80 square meters in area with a width of 90 cm (minimum) is required for performing the tests described herein. The ground plane shall be bonded at both ends to the shielded enclosure and at intervals between the ends no greater than 90 cm apart.

A.4.4.4 Bonding

The test sample shall be bonded to the ground plane by the same means with which it is bonded to the aircraft structure.

A.4.4.5 Bonding Measuring Instruments

Interference measuring instruments shall be bonded to the ground plane or shielded enclosure with the ground clip on the power cord. The counterpoise on rod antennas shall be bonded to the ground plane with a strap of sufficient length to permit the antenna to be correctly positioned. The strap shall be as wide as the counterpoise. This applies to rod antennas mounted on a separate counterpoise. The interference measuring instrument shall be physically grounded to the ground plane with only one connection. If the cooper strap is used, neither the ground clip, the ground terminals, nor the power supply shall be connected at any test frequency. When tuned and calibrated for a measurement, and loaded with a dummy antenna, the measuring instrument shall show no change from the internal background duirng on-off operation of the test sample.

A.4.4.6 Operator Position

No part of the operator's body shall make electrical contact with the ground plane during EMI tests. In addition, during radiated interference tests, the position of the operator's body shall be such as to produce minimum effect on the measurement being made, insofar as practical.

A.4.5 Test Procedure

For the purpose of this example, it is assumed that a performance test has been completed prior to the start of EMI tests.

A.4.5.1 Conducted Emission (non-coax lines)

A.4.5.1.1 Connect a test setup as shown in Figure A-1 and perform a functional check on the test sample.

A.4.5.1.2 Clamp the current probe around the AC power input wire and set the spectrum analyzer to sweep from 30 Hz to 50 MHz. Search along the power line for the maximum reading.

A.4.5.1.3 Record the peak instantaneous and average current spectrum on the power wire from 30 Hz to 50 MHz.

A.4.5.1.4 Conducted emissions in excess of the limits shown in Figures A-5 and A-o shall not appear on the power wire.

A.4.5.1.5 Repeat the conducted current measurements for the heading, and bearing and audio wires.

A.4.5.1.6 Conducted emissions shall not exceed the limits shown in Figures A-7 and A-8 for the heading wire, Figures A-9 and A-10 for the audio wire.

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A.4.5.2 Conducted Emission (coax lines)

A.4.5.2.1 Connect a setup as shown in Figure A-2 for the TACAN T/R mode and select channel 50.

A.4.5.2.1.1 Set up the recording system to cover the frequency range of 12 KHz to 12.4 GHz and record the peak instantaneous and average current.

A.4.5.2.1.2 The conducted emissions shall not exceed the limits shown in Figures A-11 and A-12.

A.4.5.3 Equipment Case Radiated Emissions

A.4.5.3.1 Connect the test setup as shown in Figure A-3 for the T/R mode and select channel 50.

A.4.5.3.2 Probe each face of the test sample at frequencies from 50 KHz to 10 GHz to determine the location of maximum radiation from the case. Orient the test sample so that the test antenna is directed at the maximum radiation point.

A.4.5.3.3 Record the peak instantaneous and average electric radiated field emission from 50 KHz to 10 GHz.

A.4.5.3.4 If the recorded values are below the limits of Figures A-13 & A-14, the sample is considered acceptable, if the values are above the limits, the test sample loads shall be located outside the shielded room and the wires run through a shield from the test sample to the shielded room wall as shown in Figure A-3.

A.4.5.3.5 Rerun the radiated tests for compliance to the limits.

A.4.5.4 Conducted Susceptibility

A.4.5.4.1 Connect a test setup as shown in Figure A-4 for the T/R mode. Set to channel 50 and adjust the volume control for a discernable level. Adjust the Beacon Simulator for a -90 dBm signal.

A.4.5.4.2 Inject the signal levels and frequencies indicated in Figure A-15 for the coax line.

A.4.5.4.3 The interfering signal shall not cause the Range Indicator or Bearing Indicator to lose lock.

A.4.5.4.4 With the TACAN still in the T/R mode, inject the signals of Figure A-16 into the primary power line.

A.4.5.4.5 The interfering signals shall not cause the Range Indicator or Bearing Indicator to lose lock.

A.4.5.5 Radiated Susceptibility

A.4.5.5.1 Connect a test setup as shown in Figure A-3 for the T/R mode. Set to channel 50 and adjust the volume control for a discernable level. Adjust the Beacon Simulator for a -90 dBm signal.

A.4.5.5.2 Calibrate the susceptibility source by substituting a calibrated receiving antenna in place of the test sample and recording the transmitted power required to establish the field intensity levels at the test sample as shown in Figure A-17.

A.4.5.5.3 Aim the source antenna at the test sample face established as the highest emission location.

A.4.5.5.4 Establish the required field intensity levels and observe that the bearing and range indicator does not lose lock.

A.4.5.5.5 If degradation is observed, change the test setup to that of Figure A-3 with the test loads and power lines located outside the shielded room and connected from the room wall to the test sample through an overall shield. Repeat the test.
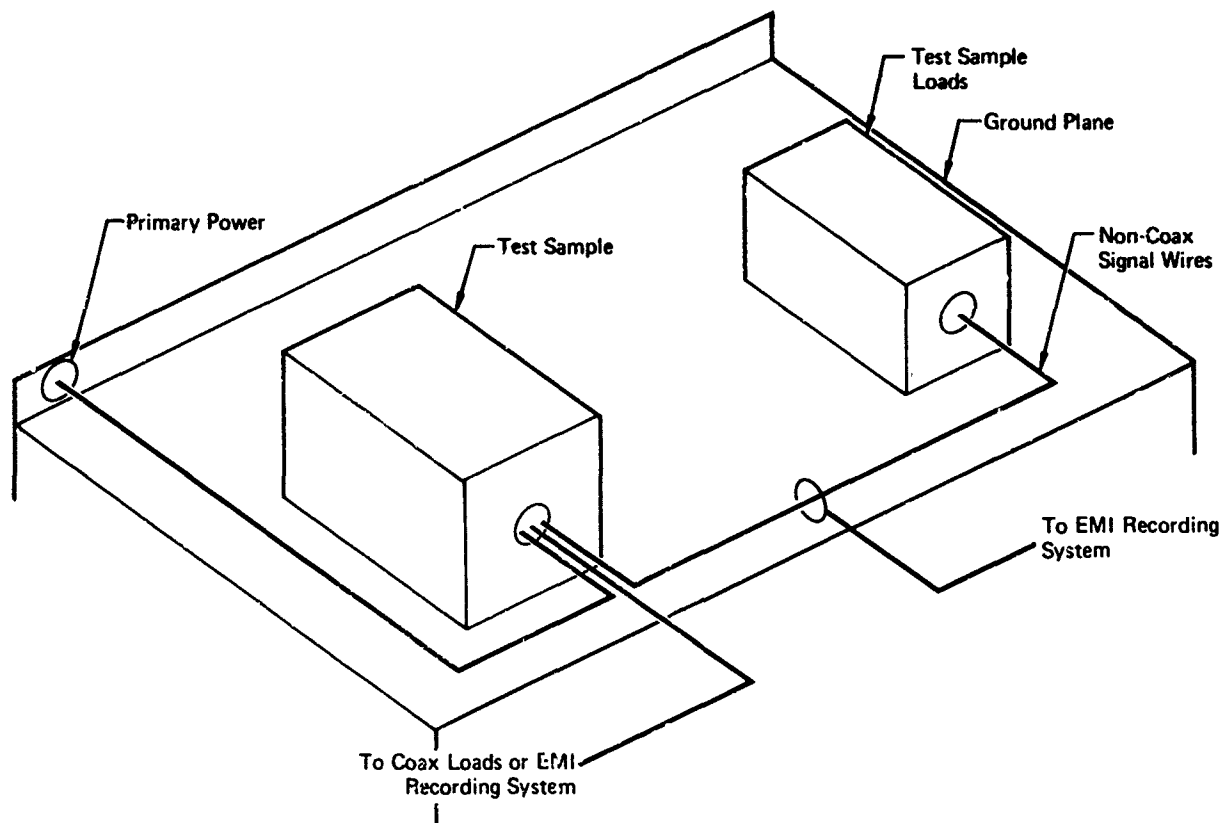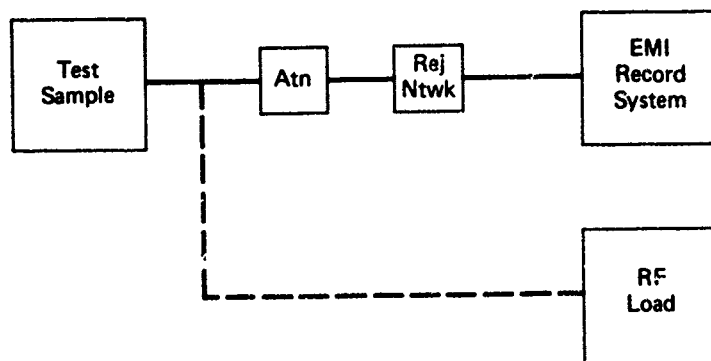
FIGURE A-1
CONDUCTED EMISSION TEST SETUP

G*73 1075 40

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FIGURE A-2
BLOCK DIAGRAM KEY-DOWN TESTS

GP73-1075-39

Note: Dashed lines indicate
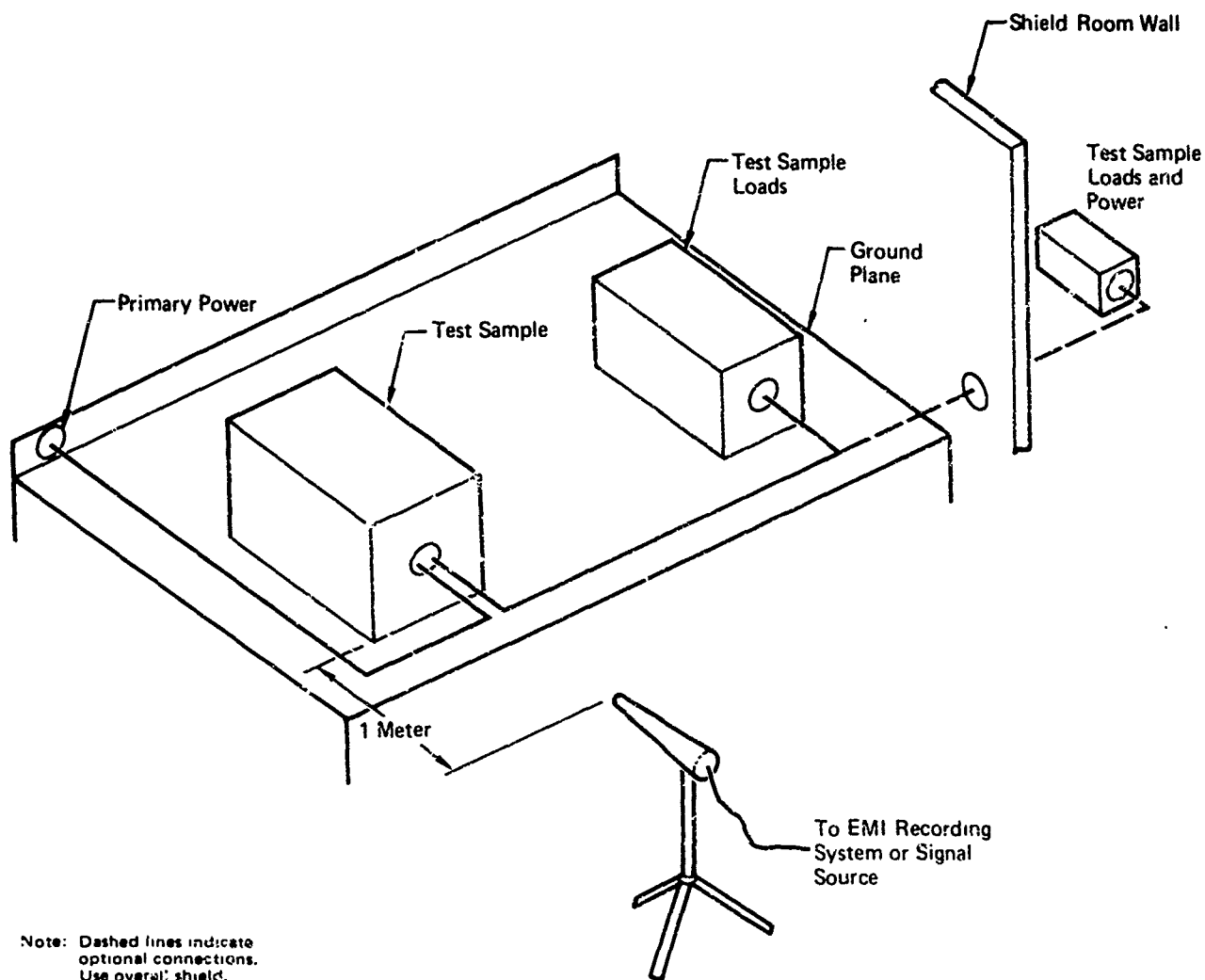optional connections.
Use overall shield.

FIGURE A-3
RADIATED EMISSION/SUSCEPTIBILITY TEST SETUP
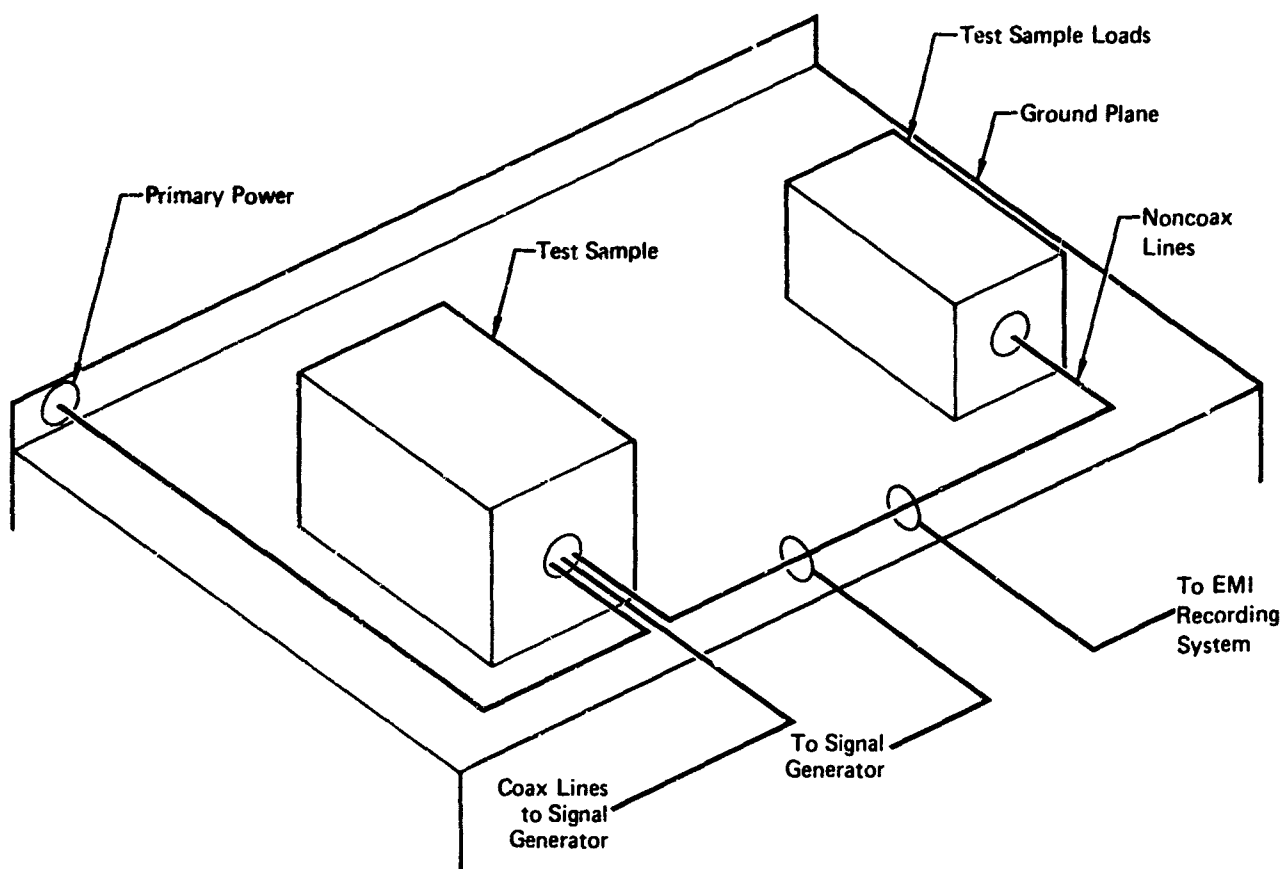
GP73 1075 41

FIGURE A-4
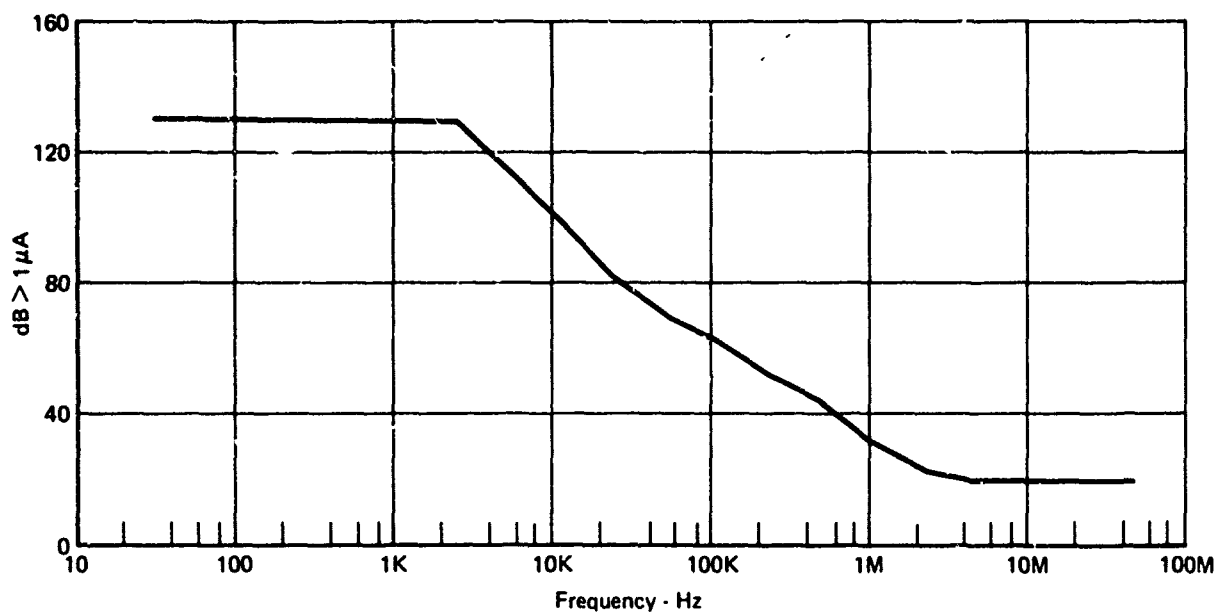CONDUCTED SUSCEPTIBILITY TEST SETUP

GP73 1075 42

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FIGURE A-5
EMI NARROWBAND SPECIFICATION LIMIT
TACAN POWER

GP73 1075 43
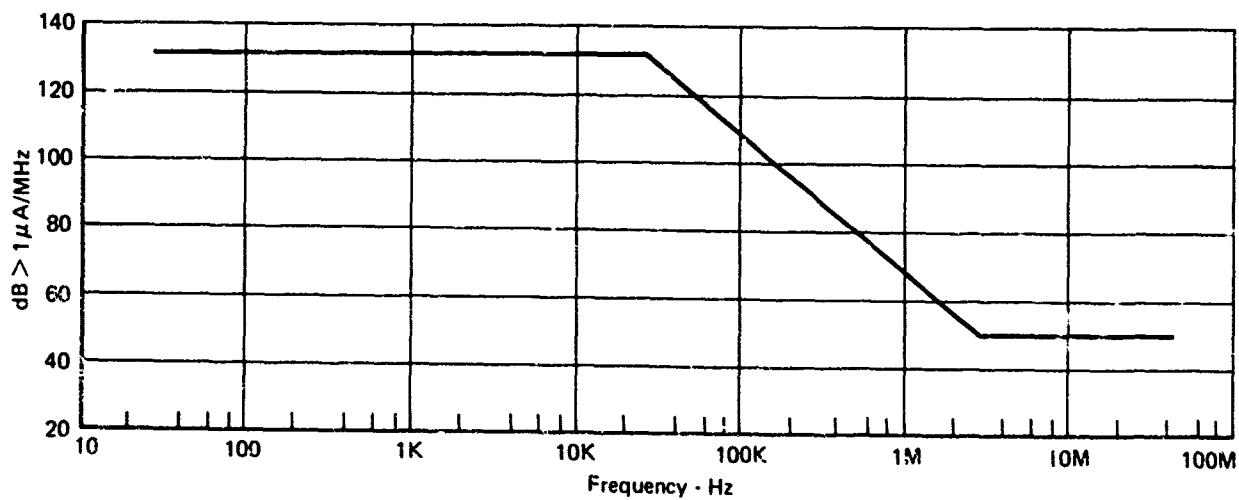
FIGURE A-6
EMi BROADBAND SPECIFICATION LIMIT
TACAN POWER

GP73 1075 44

169
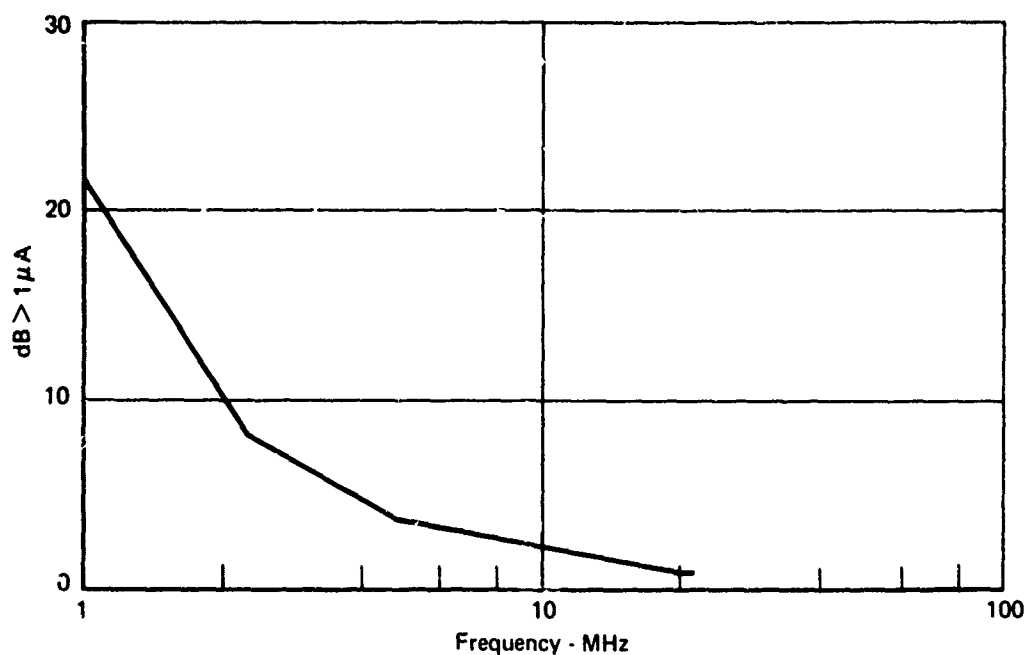
FIGURE A-7
EMI NARROWBAND SPECIFICATION LIMIT
TACAN BEARING AND HEADING

GP73 1075 55
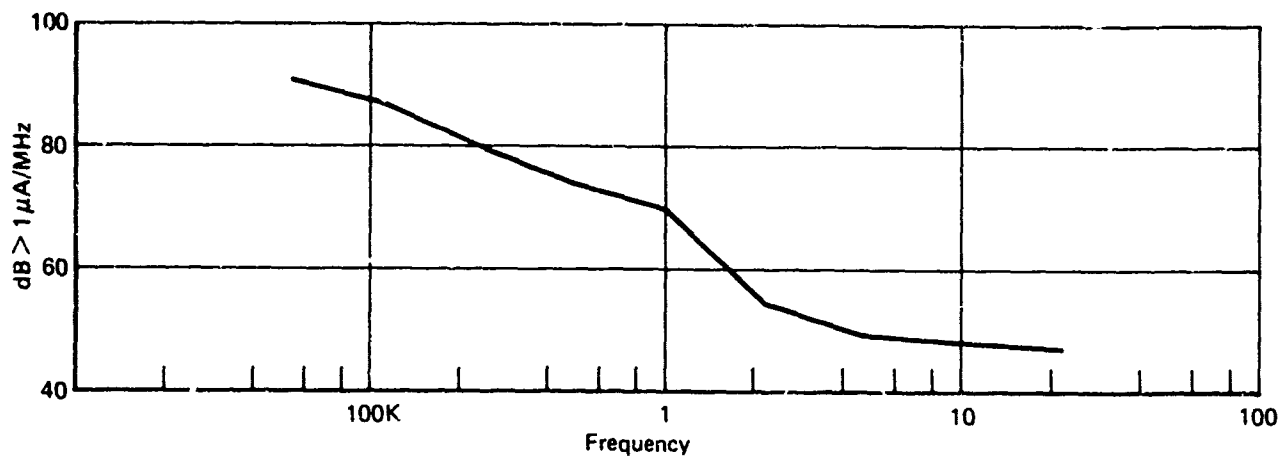
FIGURE A-8
EMI BROADBAND SPECIFICATION LIMIT
TACAN BEARING AND HEADING

GP73 1075 54

170
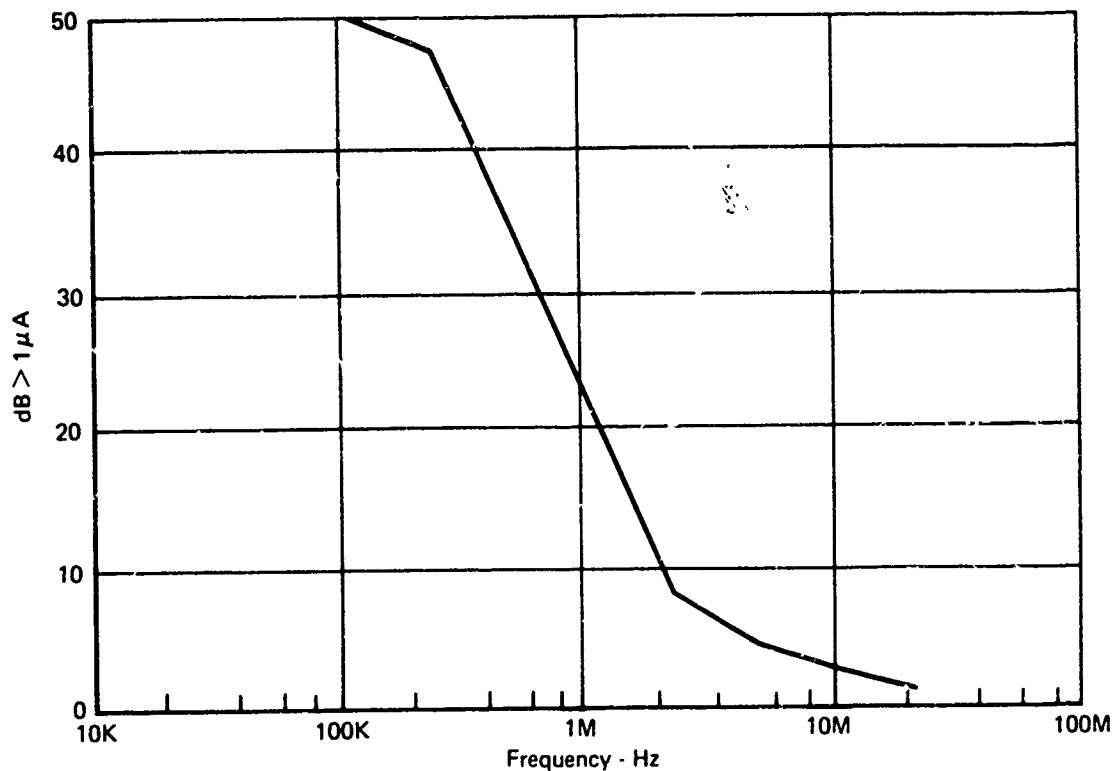
FIGURE A-9
EMI NARROWBAND SPECIFICATION LIMIT
TACAN AUDIO

GP73 1075 53
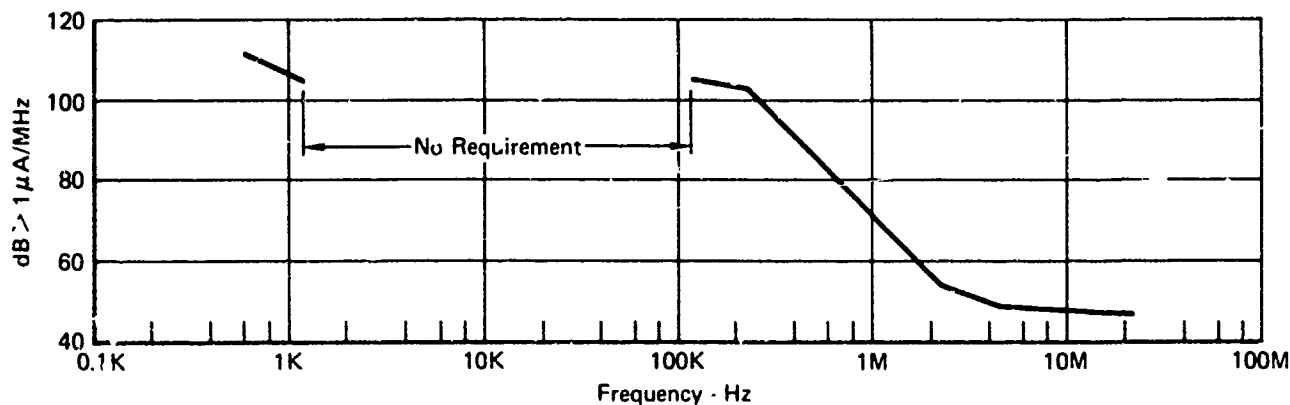
FIGURE A-10
EMI BROADBAND SPECIFICATION LIMIT
TACAN AUDIO

GP73 1075 52

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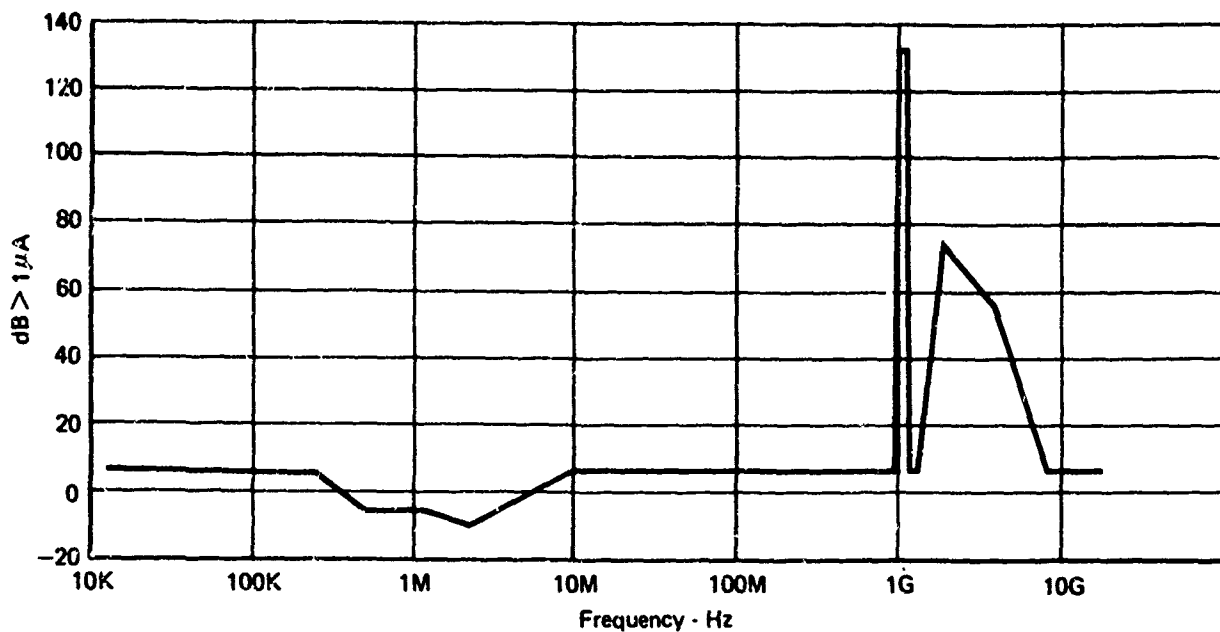
FIGURE A-11
EMI NARROWBAND SPECIFICATION LIMIT
TACAN RF

GP73-1075 51
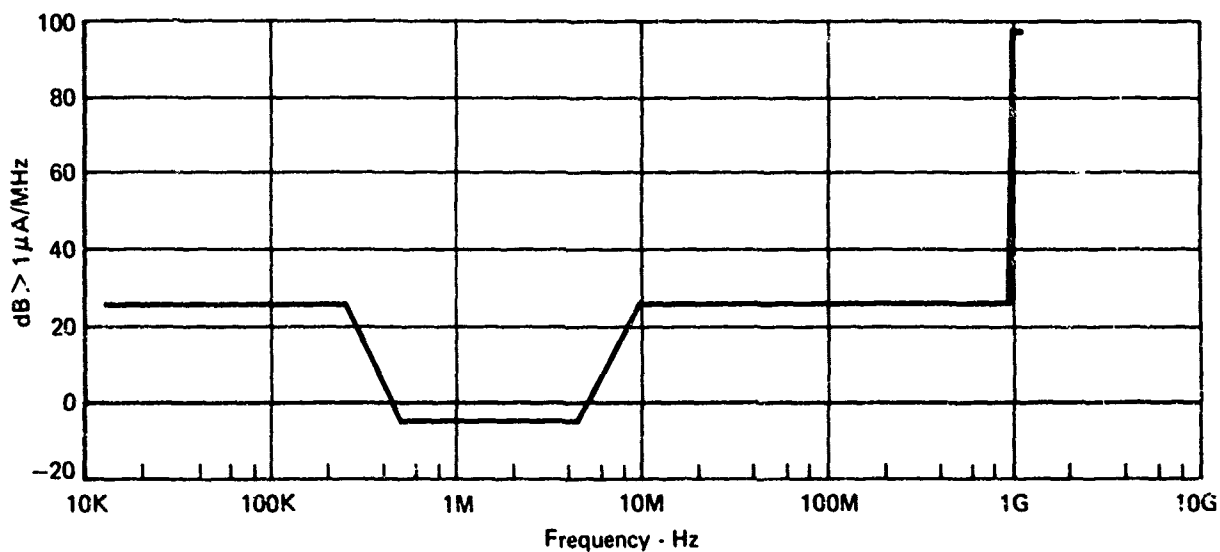
FIGURE A-12
EMI BROADBAND SPECIFICATION LIMIT
TACAN RF

GP73 1075 50
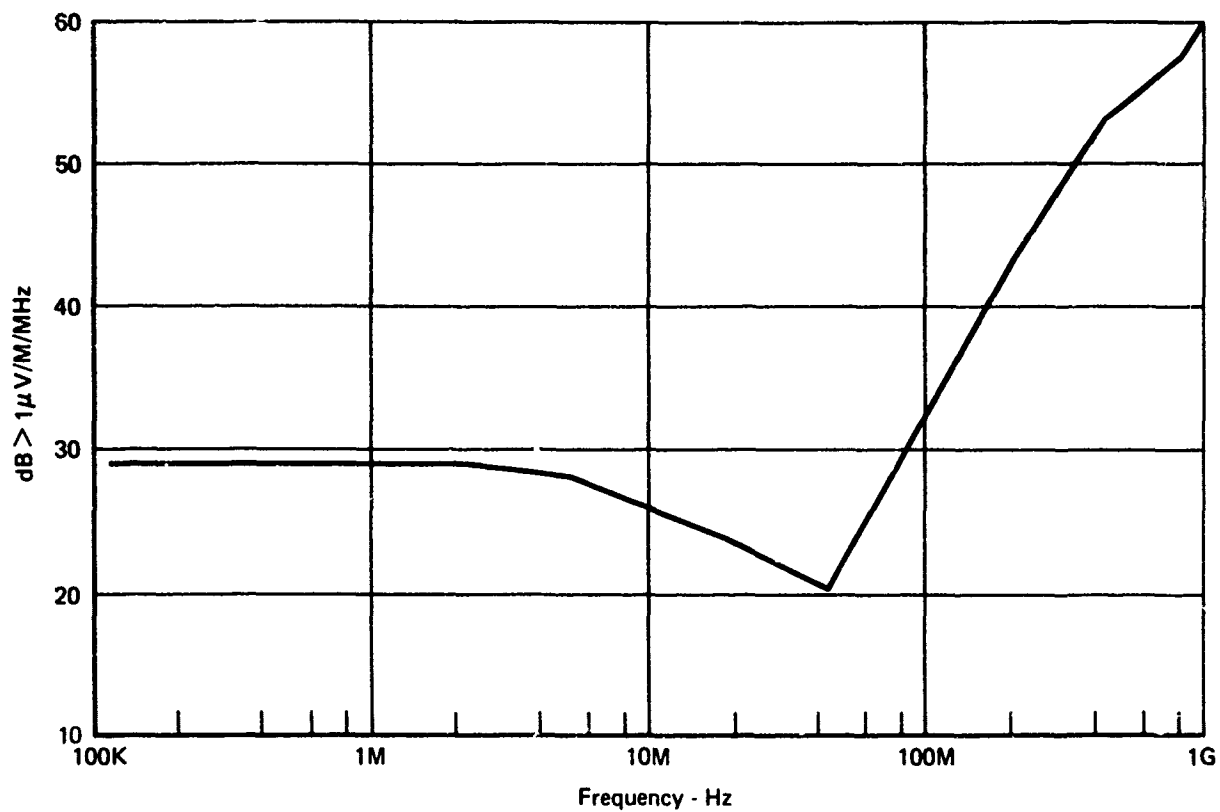
FIGURE A-13
EMI NARROWBAND RADIATION LIMIT
TACAN CASE

GP73 1075 49

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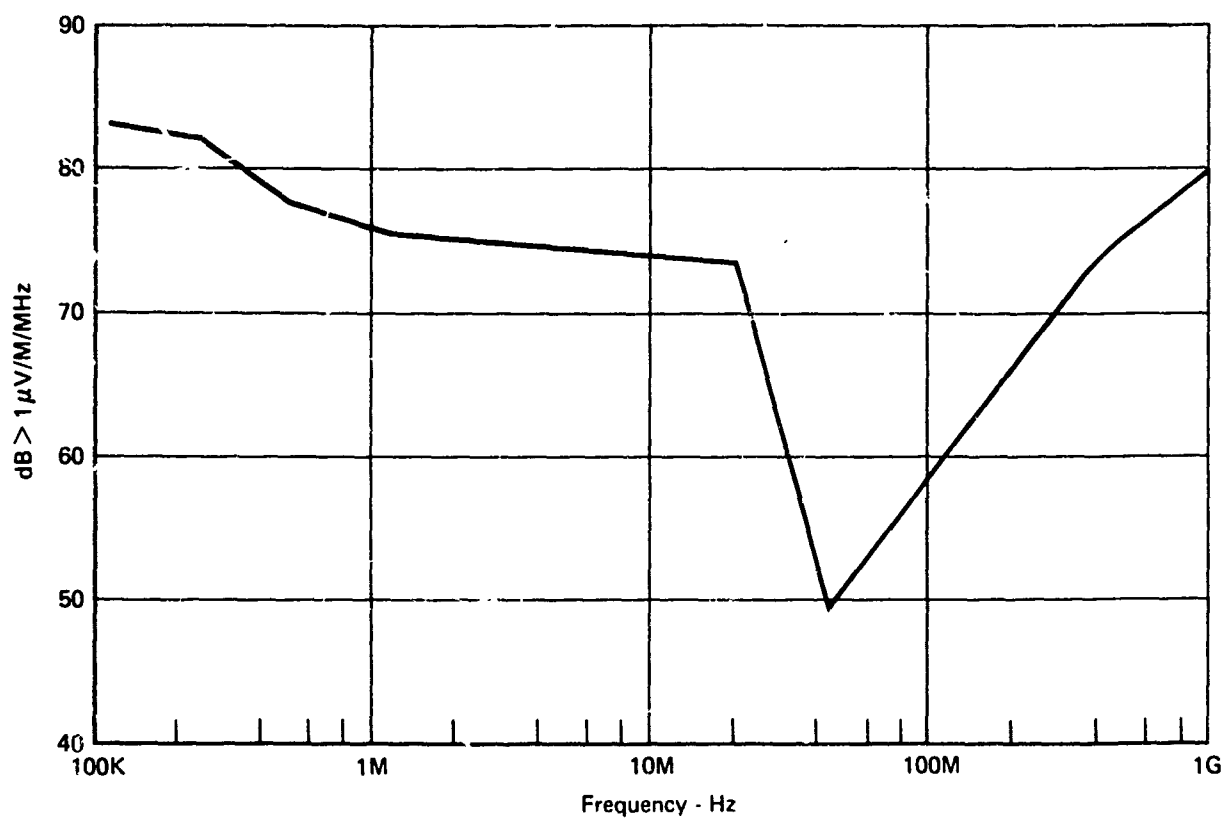
FIGURE A-14
EMI BROADBAND RADIATION LIMIT
TACAN CASE

GP73 1075 48

174
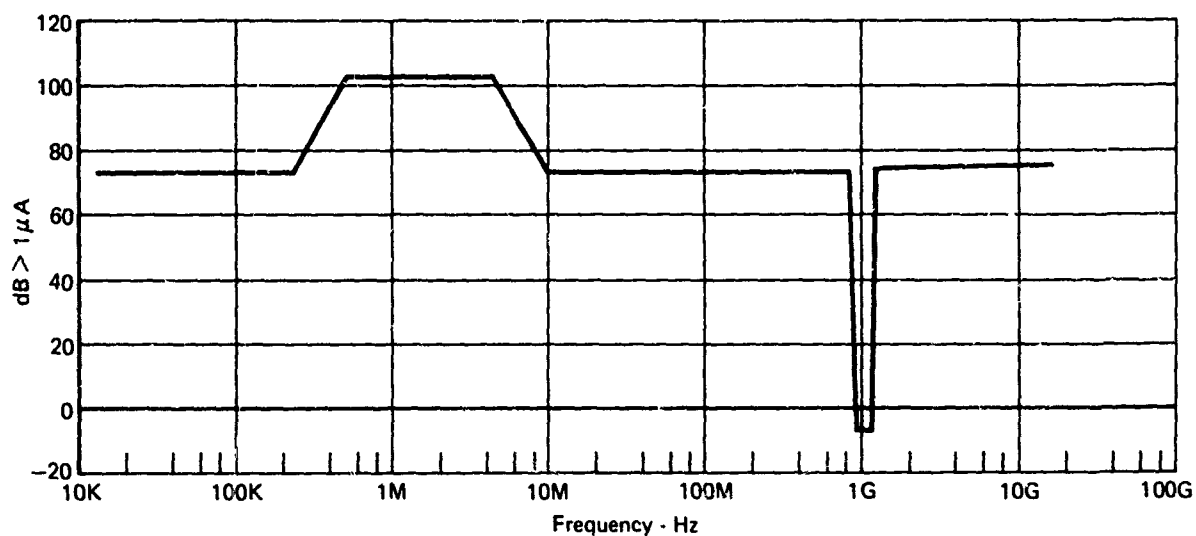
FIGURE A-15
CONDUCTED SUSCEPTIBILITY LIMIT
TACAN RF

GP73 1075 47
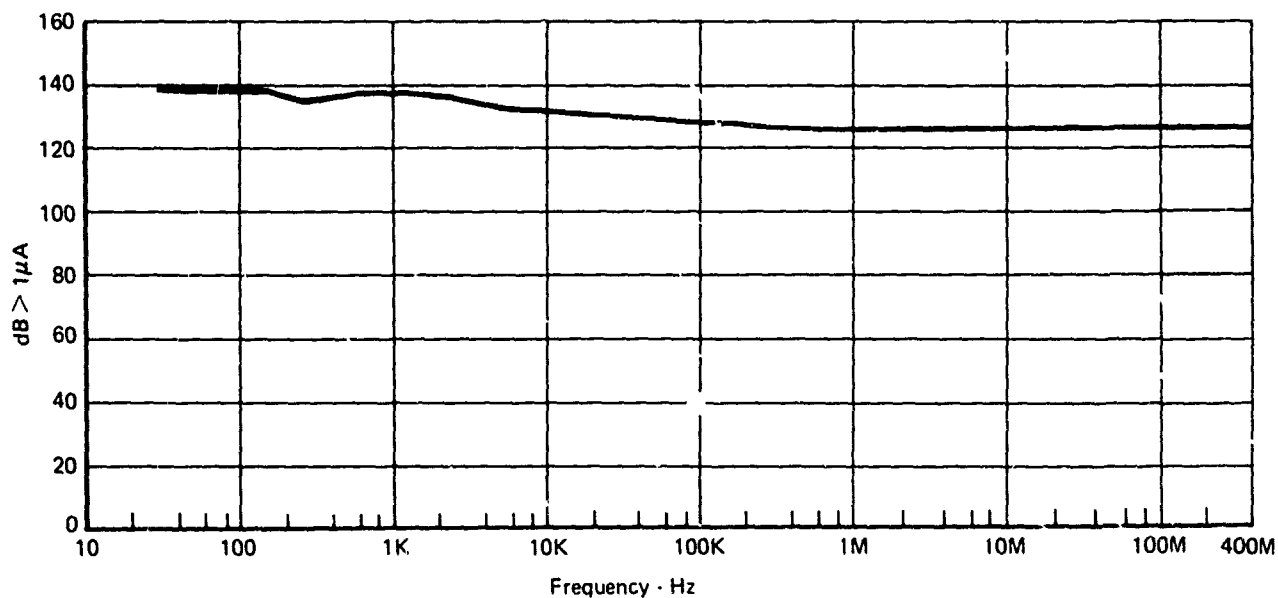
FIGURE A-16
SUSCEPTIBILITY LIMIT
TACAN POWER

GP73 1075 46

FIGURE A-17
RADIATED SUSCEPTIBILITY LIMIT
TACAN CASE

GP73 1075-45

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APPENDIX B

MERGE UTILITY PROGRAM

B.1   GENERAL

The supplementary computer program called MERGE is supplied with the IEMCAP program for the purpose of manipulating ISF files. It provides the capability of combining the data on two existing ISF files, as directed by the user, to form a composite file consisting of selected portions of the original files.

For this process, one of the two original files is designated as the Master file and the other as the Modify file. The new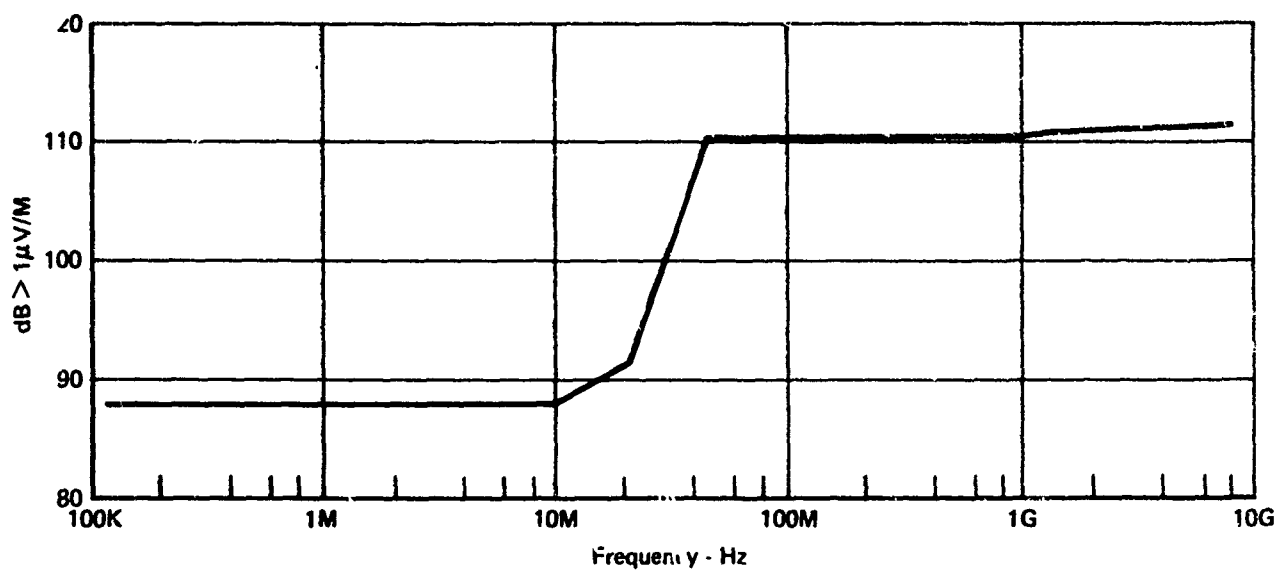 file created is called the Updated file. During the MERGE run, all data on the Master file is automatically written on the new Updated file unless instructions are given for this data to be deleted. Conversely, none of the data on the Modify file is written on the Updated file unless the appropriate add commands are given to MERGE.

The data input for the MERGE program consists of fixed format statements which define the data to be deleted from the Master file and the data to be added from the Modify file. The only provisions for insertion of new data (data not on either existing file) is the option of writing a new file title and/or new remarks.

B.2   DATA ORGANIZATION

For purposes of MERGE, the ISF data is organized into data blocks (section B.3.1). These data blocks are subdivided into data sets or parameters which have ID's which are used to specify the data to be manipulated. That is, the only manner in which data may be divided for manipulation by MERGE is by the ID's which identify the various data sets or parameters as described in section B.3.2. Any changes in ISF data which do not correspond to these data sets must be performed via an IDIPR modify run.

B.2.1   SIZE LIMITATIONS

The maximum dimensions of the Updated file data (except equipment data and wire bundle data) must be the same as the corresponding limits for the IEMCAP program (see section 5.3). Any instructions to the MERGE program which attempt to add data sets larger than these dimensions to the Updated file will produce an error. There is no limitation to the number of equipments or wire bundles which may be written on the Updated file. However, it should be noted that if the IEMCAP size limitations for equipment or wire bundles is exceeded, the Update file cannot be used as an old ISF for an IEMCAP run.

B.3   INPUT DATA

The MERGE program is designed to accept user inputs in the form of fixed format only. These instructions may be either commands to add or delete data or they may be instructions to insert a new ISF title or remark.

The delete command (D=) is used to delete data from the Master ISF as the modified ISF is written by MERGE. Similarly, the add command (A=) is used to add data to the Updated ISF from the Modify ISF. In cases where the data may

have many different sets of values (as for example in the case of aperture data), the Updated ISF is written from the Master ISF aperture data (less the deleted apertures) plus the apertures added from the Modify ISF. When the data may have only one value (for example, the EMI margin print limit) either the command to delete the Master ISF data or to add the Modify ISF data have the effect of replacing the Master file data with the Modify file data in the Updated file. In this case it is not necessary to give both the delete and add commands (although this is permissible) as either of these commands suffices.

B.3.1 DATA BLOCKS

For purposes of user instructions to MERGE, the ISF data has been divided into data blocks which have title records. These title records indicate that the data immediately following belongs to that data block. Certain data blocks also have ending markers which mark the end of the data block.

The data blocks may have any order. Also, instructions within a data block may be in any order. However, each block must be preceded by its title record and all data blocks which have ending markers must be terminated with this end record.

The data blocks are divided as shown in Table B-1. The data block titles (and end markers) are required only for those data blocks which have add or delete commands. The only card which is always required is the end of data card. This card has the form

END DATA

and must be physically the last data card. If this card is used as the only data input, the Updated file becomes a copy of the Master file.

B.3.2 INPUT DATA FORMATS FOR MERGE

The format of all MERGE input data is given in this paragraph. All inputs must begin in Column 1 and no blanks are permitted except for the blanks which are a part of the system parameter identifications or the data block title records or end markers.

B.3.2.1 SYSTEM DATA

As shown in Table B-1, the title records for new ISF title data (NEW TITLE) and for new remarks data (NEW REMARKS) do not have an end marker while all other System data blocks have both title records and end markers. The title records (and end markers) are required only for those data blocks which have add or delete commands. If there is system data of any type, the end of the system data is marked by an end of system data card. This card has the form

END OF SYSTEM

If there is no system data, this card is not required.

TABLE B-1

MERGE DATA BLOCKS

	DATA BLOCK	END MARKER
SYSTEM DATA	NEW TITLE	
	NEW REMARKS	
	SYSTEM,BASIC	END BASIC
	SYSTEM,APERTURES	END APERTURES
	SYSTEM,ANTENNAS	END ANTENNAS
	SYSTEM,FILTERS	END FILTERS
	SYSTEM,WCT	END WCT
	SYSTEM,FIELDS	END FIELDS
SUB-SYSTEM DATA	EQUIPMENTS	END EQUIPMENTS
	WIRE BUNDLES	END BUNDLES

INPUTS FOR TITLE DATA -

Two options are possible for the title on MERGE created ISF. Either the
Master file title may be used or a new title may be written. To use the Master
file title, no input to MERGE is required. For a new title the following input
cards are required:

                    NEW TITLE
                    L=nnn
                    New ISF title (up to 160 characters)

where nnn is the exact character length of the title record, including blanks.
A maximum of 80 characters per card are allowed but the total number of
characters must not be greater than 160 (2 cards). For example, the title
"Updated ISF for Aircraft Test Case" could be written by the following cards.

                    NEW TITLE
                    L=34
                    Updated ISF for Aircraft Test Case

INPUTS FOR REMARKS DATA -

Exactly the same options as described in the previous paragraph for title
data apply for the remarks data. The input cards required for the insertion of
the new remarks are:

                    NEW REMARKS
                    L=nnn
                    New remarks for ISF (up to 400 characters)

where nnn is the exact character length of the remarks record including
blanks. A maximum of 80 characters per card are allowed. The record may be
continued for a total of 5 cards (400 characters).

INPUTS FOR BASIC SYSTEM DATA -

The data described in Sections 5.7.4.1 through 5.7.4.3 are classified as
basic system data for purposes of MERGE. If it is necessary to write basic
system data from the Modify ISF instead of the Master ISF, two instructions are
necessary. First, the data block title (SYSTEM, BASIC) must be given followed
by add (or delete) commands for every parameter to be written from the Modify
file. Either the command to add data from the Modify file (A=) or the command
to delete Master file data (D=) causes the specified data to be written from
the Modify file.

The general form for replacing the Master file basic system data with the
Modify file data is

TABLE B-2

BASIC SYSTEM DATA

Parameter Identification	Explanation
SYSTEMTYPE	System Type
LONGITUDE	Longitude
LATITUDE	Latitude
ALTITUDE	Altitude
ASM	Adjustment Safety Margin
EMPL	EMI Margin Print Limit
SIGMA	Conductivity
EPSILON	Relative Permittivity
CON NOS LIM	Conical Nose Limit
FUSE RAD	Fuselage Radius
CORE RAD	Core Radius
CNTR WL	Waterline of Centroid
BOT WL	Waterline of Bottom
MOD COD	Model Code
WNGRTBL	Wing Root Butt Line
WNGRTWL	Wing Root Waterline
WNGRTFFS	Wing Root Fuselage Station (Forward Edge)
WNGRTAFS	Wing Root Fuselage Station (Aft Edge)
WNGTPBL	Wingtip Butt Line
WNGTPWL	Wingtip Waterline
WNGTPFFS	Wingtip Fuselage Station (Forward Edge)
WNGTPAFS	Wingtip Fuselage Station (Aft Edge)

```
            SYSTEM,BASIC
            D=basic parameter #1
            D=basic parameter #2
              o
              o
              o
            END BASIC
```

where the basic parameters are any of the parameters given in Table B-2 (any or all of the instructions D= could be replaced by A= if desired).

The command END BASIC marks the end of basic system data and is required if the SYSTEM,BASIC title is used.

INPUTS FOR APERTURE DATA -

The Aperture Data (Section 5.7.4.4) is manipulated by MERGE in blocks of data corresponding to the aperture ID's. MERGE writes all aperture data from the Master file, except that deleted by a D=command, to the Updated file. It then writes the aperture data (if any) which is added from the Modify file by add commands.

The general form for this is

```
            SYSTEM,APERTURES
            D=Master File Aperture ID #1
            D=Master File Aperture ID #2
              o
              o
              o
            A=Modify File Aperture ID #1
            A=Modify File Aperture ID #2
              o
              o
              o
            END APERTURES
```

where the aperture ID's are the 5 letter alpha code aperture ID's in the Master and Modify files.

INPUTS FOR ANTENNA DATA -

The Antenna Data (Section 5..4.5) is handled in the same manner as the aperture data previously described.

The general input format for these instructions is

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```
                    SYSTEM,ANTENNAS
                    D=Master File Antenna ID #1
                    D=Master File Antenna ID #2
                     o
                     o
                     o
                    A=Modify File Antenna ID #1
                    A=Modify File Antenna ID #2
                     o
                     o
                     o
                    END ANTENNAS
```

INPUTS FOR FILTER DATA -

Filter Data (Section 5.7.4.6) is manipulated according to the filter ID as described in the previous sections. The general input format is

```
                    SYSTEM,FILTFRS
                    D=Master File Filter ID #1
                    D=Master File Filter ID #2
                     o
                     o
                     o
                    A=Modify File Filter ID #1
                    A=Modify File Filter ID #2
                     o
                     o
                     o
                    END FILTERS
```

INPUT FOR WIRE CHARACTERISTICS TABLE DATA -

Wire Characteristics Table Data (Section 5.7.4.7) is manipulated according to Wire type ID (see previous sections).

The general input format is

```
                    SYSTEM,WCT
                    D=Master File Wire Type ID #1
                    D=Master File Wire Type ID #2
                     o
                     o
                     o
                    A=Modify File Wire Type ID #1
                    A=Modify File Wire Type ID #2
                     o
                     o
                     o
                    END WCT
```

INPUTS FOR ENVIRONMENTAL FIELD DATA –

The Environmental Field Data (Section 5.7.4.8) for the Updated ISF is written either in total from the Master file (default) or in total from the Modify file. The input instruction for use of the Modify file environmental fields is

```
SYSTEM,FIELDS
D=EVFLDS
END FIELDS
```

B.3.2.2 SUBSYSTEM DATA

The MERGE, all data pertaining to equipment and wire bundles is classified as subsystem data. If any instructions for merging this subsystem data are given, these instructions must be preceded by a subsystem card and followed by an end of subsystem card. These cards have the form

```
SUB-SYSTEM
END OF SUB-SYSTEM
```

where all cards with instructions for merging equipment and bundle data must be between these two cards.

INPUTS FOR EQUIPMENT DATA –

The Equipment Data (Section 5.7.5.2) can be manipulated by MERGE only in blocks containing all data associated with a particular equipment. This includes all port data, including port spectra, for the equipment in question.

The basic form for the instructions for merging equipment data is as follows

```
EQUIPMENTS
D=Master File Equipment ID #1
D=Master File Equipment ID #2
  o
  o
  o
A=Modify File Equipment ID #1
A=Modify File Equipment ID #2
  o
  o
  o
END EQUIPMENTS
```

where all the ID's following the D= are deleted from the Master file and all ID's following the A= are added from the Modify file as the Updated file is written. The title record, EQUIPMENTS, and the end of data block marker, END EQUIPMENTS, are required only if equipment records are added to (or deleted from) the Master file.

INPUTS FOR BUNDLE DATA -

The Bundle Data (Section 5.7.6) is merged in the same manner as the Equipment Data. The form for the instructions is

```
WIRE BUNDLES
D=Master File Bundle ID #1
D=Master File Bundle ID #2
 o
 o
 o
A=Modify File Bundle ID #1
A=Modify File Bundle ID #2
 o
 o
 o
END BUNDLES
```

B.3.2.3 EXAMPLE INPUT

An example of a possible data input to MERGE is as follows:

TABLE B-3

EXAMPLE INPUT

INPUT	COLUMNS
NEW TITLE	1-9
L=25	1-4
UPDATED INTRA-SYSTEM FILE	1-25
SYSTEM,BASIC	1-12
D=ASM	1-5
D=EMPL	1-6
END BASIC	1-9
SYSTEM,ANTENNAS	1-15
D=UHFCM	1-7
A=TACAN	1-7
END ANTENNAS	1-12
SYSTEM,FILTERS	1-14
A=FLTR8	1-7
END FILTERS	1-11
END OF SYSTEM	1-13
SUB-SYSTEM	1-10
EQUIPMENTS	. 1-10
D=INPYL	1-7
A=DISP	1-6
A=CENTL	1-7
END EQUIPMENTS	1-13
WIRE BUNDLES	1-12
D=BNDL2	1-7
END BUNDLES	. 1-10
END OF SUB-SYSTEM	1-17
END DATA	1-8

B.4 OUTPUTS

The MERGE program printed output consists of a copy of the Updated ISF file created by the run (plus possible error messages - see Paragraph B.5). If a comparison of the data on the old files (Master and Modify) with that on the Updated file is desired, the appropriate JCL cards may be inserted in the MERGE deck to give a printout of the old files. Alternatively, the Updated file can be used for an IDIPR run with a report requested. This gives a formatted summary of all data on the ISF.

B.5 ERRORS

Several types of errors may be encountered in running the MERGE program. These types are:

1. Data which is formatted incorrect.

2. Unrecognizable statements in input data.

3. Omission of required data cards such as an end marker for a data block or an END OF DATA card.

4. Creation of an ISF which is not a compatible system for IEMCAP runs.

Type 1 errors simply cause a read error in MERGE. Cards which have type 2 errors are deleted and have no contribution to the merging instructions. Type 3 errors cause fatal errors in the data input. An error message to this effect is printed by MERGE when this error occurs.

The errors classified as type 4 are not detectible by MERGE. Thus, the errors of this type simply create an ISF which is incompatible for an IEMCAP run. These errors are caused by adding (or deleting) data in such a way as to form a nonphysical system. Checks for type 4 errors can be made only by using the Updated file for an IDIPR run.

APPENDIX. C

IMOD UTILITY PROGRAM

C.1   GENERAL

A supplemental computer program, IMOD is supplied with IEMCAP to enable an EMC engineer to calculate possible intermodulation frequency situations on USAF systems. The program can be used for both transmitter and receiver intermodulation.

A possible application of this program might be for a flying command post utilizing a number of transmitters simultaneously. For instance, suppose there are three transmitters of frequencies of 115 MHz, 120 MHz, and 125 MHz respectively, where the latter two transmitters are higher power than the former. There is a possible third order combination between the latter two producing an output at 115 MHz.

The program has the capability of analyzing five transmitter frequency intervals to any order of mix, for up to ten frequency intervals of interest.

C.2   INPUTS

The required inputs to IMOD are:

o Number of transmitters (maximum = 5)
o Lower and upper ends of emission channels or tunable ranges
o Highest order intermodulation combination to be considered
o Number of frequency intervals for which intermodulation combinations are to be calculated (maximum = 10)
o Upper and lower ends of the frequency intervals described above

The program then proceeds to calculate all possible intermodulation combinations of interest and prints these in a hierarchical fashion up to the maximum order desired. In addition, orders of each transmitter frequency that go into the intermodulation order are printed along with the appropriate plus or minus sign as illustrated below:

TABLE C-1

THIRD ORDER INTERMODULATION INDICES CONSIDERED FOR TWO TRANSMITTERS

0	+3
1	2
1	-2
2	-1
2	1
3	0

The input to the program uses a fixed field form described below:

TABLE C-2

INPUT CARD FORMATS

Card	Format	Description
NT	I5	Columns 1-5 Number of transmitter frequency intervals
Intervals	F9.2	Columns 1-9 Lower end of frequency interval
	F9.2	Columns 10-18 Upper end of frequency interval
NOR	I5	Columns 1-5 Maximum order to be analyzed
NR	I5	Columns 1-5 Number of frequency intervals to be analyzed
Intervals	F9.2	Columns 1-9 Lower end of frequency interval
	F9.2	Columns 10-18 Upper end of frequency interval

The output contains the order of mix, lower and upper ends of the intermodulation frequency intervals and the indices that go into the calculation.

A sample input case is shown below:

TABLE C-3

SAMPLE INPUT DATA

Card	Input
NT	5
Interval	122., 125.
Interval	118., 125.
Interval	127., 130.
Interval	50., 75.
Interval	132., 140.
NOR	3
NR	2
Interval	225., 275.
Interval	350., 400.

The output for this input case is in the following form:

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TABLE C-4

SAMPLE OUTPUT

ORDER	FLOW	FHIGH	M	N	P	R	S
2	264.00	280.00	0	0	0	0	2
2	264.00	280.00	0	0	0	0	-2
2	259.00	270.00	0	0	1	0	1

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